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No.01

Oki Data CONFIDENTIAL

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# ML1190 PRINTER

## Maintenance Manual

### OEL/AOS

[Rev. 8]

3

#### Related drawings

2

Drawing No.	Name
43516901TL	ML1190 Disassembly for Maintenance
43516901TR	ML1190 RSPL

1

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## PREFACE

This maintenance manual describes how to maintain the ML1190 printer in the field.

This manual is for customer engineers.

For further information, refer to the Users Manual for handling or operating the equipment.

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## 1. CONFIGURATION

### 1.1 Standard Printer Configuration

The standard configuration of the ML1190 is as follows:

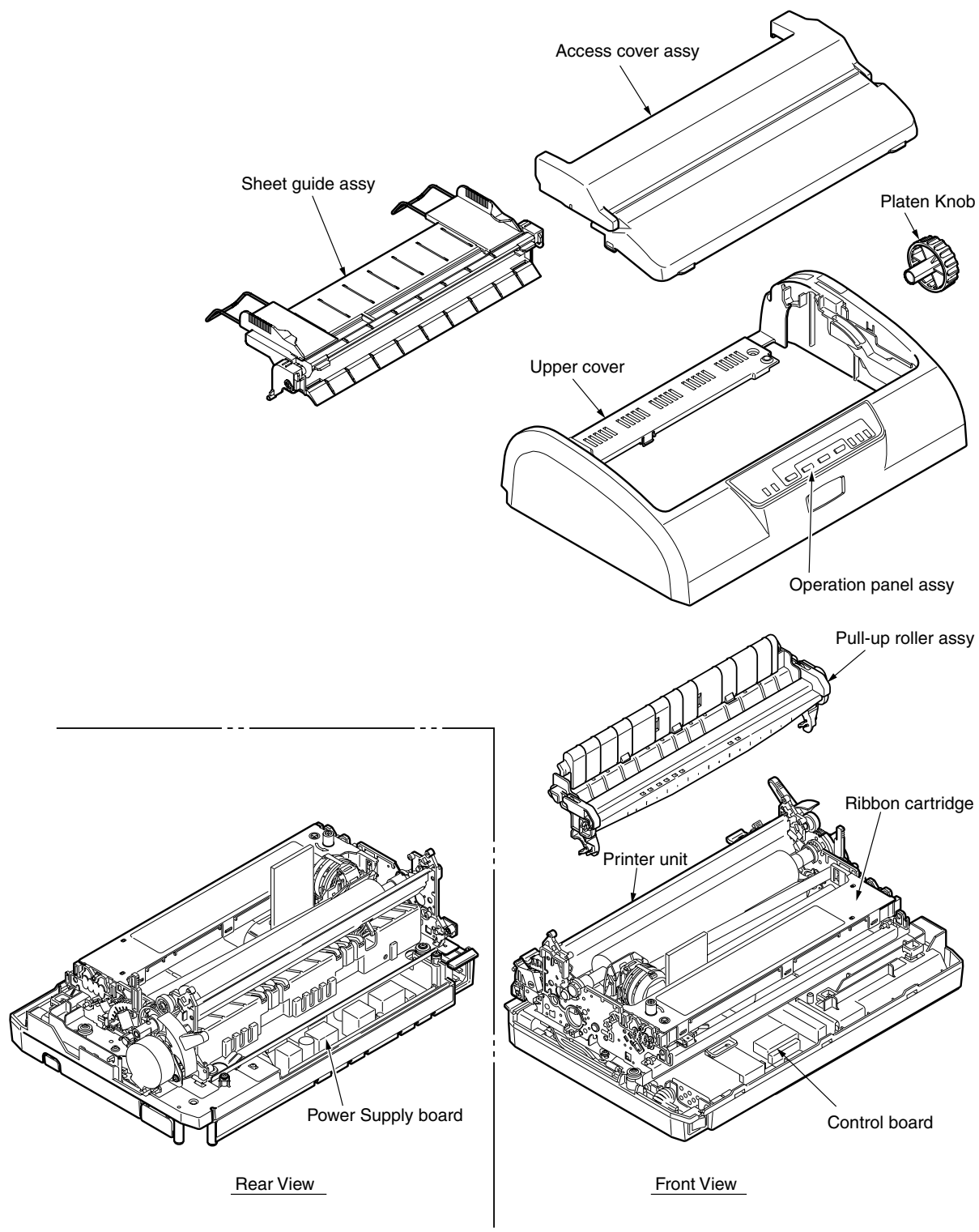


Figure 1-1. Printer Configuration

## 2. OPERATION

### 2.1 Summary

The main configuration of this printer is the print mechanism unit and print control unit.

The print mechanism unit can be divided broadly into the print head, space system, paper-feed system, and ribbon-feed system. The operation of each item is listed below.

- (1) Print head ..... Prints with the 24 wire-dot magnet. The dot patterns are configured in the print control unit.
- (2) Space system ..... The stepping motor moves the carriage and performs spacing, tab, and carriage return.
- (3) Paper-feed system ..... Paper is feed by the stepping motor.
- (4) Ribbon-feed system ..... Ribbon is feed by obtaining drive force from the stepping motor just as in the space system.
- (5) Print control unit ..... Controls the interface and mechanism with one MSM67X640 microprocessor ( $\mu$ CPU).

## 2.2 Circuit Operation (See Figure 1)

The circuit of this printer consists of the control board and carriage board.

Circuits such as  $\mu$ CPU and its peripheral circuits, drive circuits, and the external interface circuit are set on the control board.

The switches and LED are set on the control board.

With the control board being the main board, the boards are connected by cables.

### 2.2.1 CPU and peripheral circuits

#### (1) CPU (MSM67X640)

The CPU is a 16-bit one-chip CPU which operates the peripheral circuits. Each I/O port is set as ADDRESS - BUS, DATA - BUS, and various control lines. It is capable of 4-channel A/D converter input and has five timers.

#### (2) Program ROM (Flash Memory)

The control program of the printer is stored.  $\mu$ CPU operates according to the contents and various controls are performed.

#### (3) Printer Buffer etc (D-RAM)

This is used to store various data for data received in 4Mbit RAM or print buffer, etc.

#### (4) LSI (MG74Q514-131)

This is an LSI exclusively for the print head controller, external interface, and motor control. It has the following functions.

##### (a) Print head data control

Print data is unarchived to the print timing of a disperse allocation head and controls 24-pin worth of impact data drive time.

##### (b) Dot timing generating function

Dot timing (IPT) in sync with the print speed is generated and notifies the information to CPU.

##### (c) Speed control function of the space motor

The speed of the space motor is controlled and input command from CPU. Furthermore, the space motor speed in various print modes are also controlled.

##### (d) Parallel interface function

IFD 1-8 are used as input/output data of parallel data. Parallel data sent from the interface connector is latched by strobe signal STB-N and is read into CPU by a RD signal. Furthermore, control signals such as BSY-N, ACK, PE-N, and SEL-N are output to the interface connector by WR signals.

##### (e) I/O port

The I/O port has 14-bit input/output ports and controls various signals by input command from CPU.



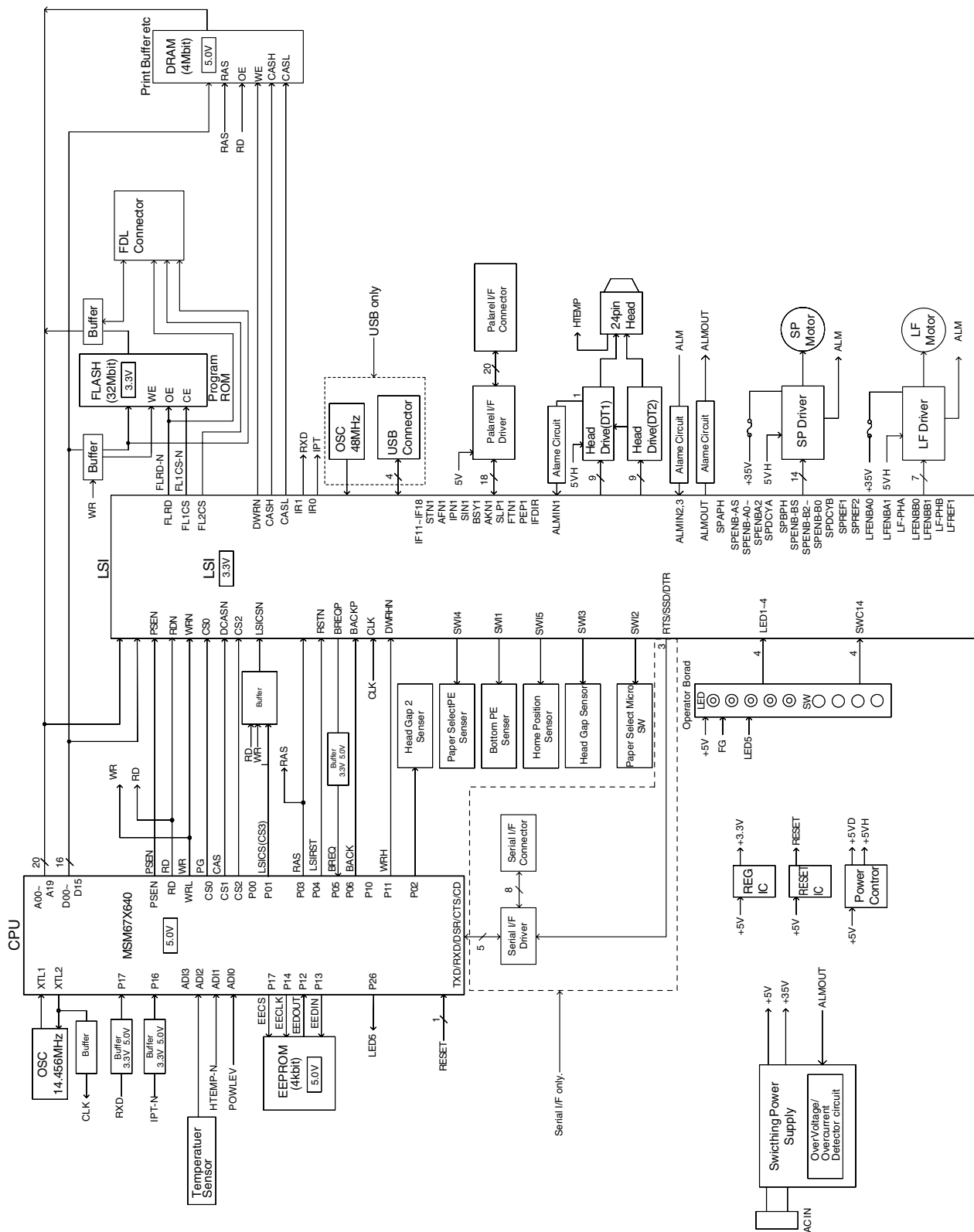


Figure 1

### 2.2.2 Initializing operation

The initializing operation is performed for this printer when the power is turned ON and when I-PRIME for the parallel interface is input from the Host.

In the initializing operation, the RST-N signal is first output from the reset IC (RST-1 pin) to reset CPU. The program start after CPU is reset.

The program sets the LSI mode including CPU, checks the memory (ROM/RAM), and initializes the RAM. Then it determines the phase of the LF motor and performs homing for the carriage. Finally, it determines the interface signal (outputs ACK signal and BUSY signal), illuminates the (A) lamp, notifies the Host that it is in a mode that can receive data (data standby mode), and completes initialization. (Paper-end mode when using continuous form is excluded.)

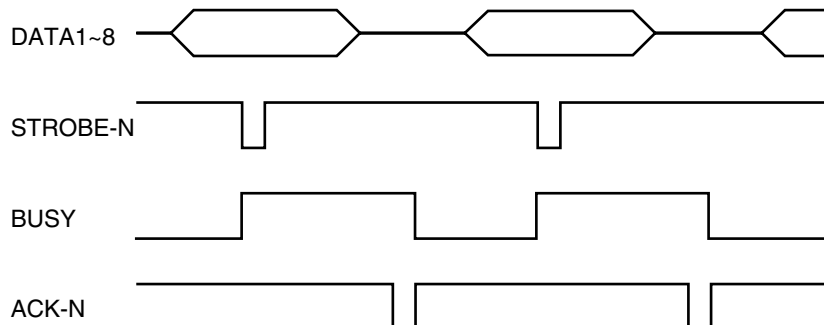
### 2.2.3 Controlling the interface

#### 1) Parallel interface

Data from the interface is input from the connector (CENT) and is read in the timing of the STB-N signal by the interface, print head, and LSI for motor control (MG74Q514-131).

When this signal is being process, the BUSY signal goes ON. When the process is completed, the BUSY signal goes OFF, sends an ACK-N signal, and waits to receive the next data.

(E.g.) When [I/F timing] is set to [A-B] in an English menu.



### 2.2.4 Print head control drive circuit

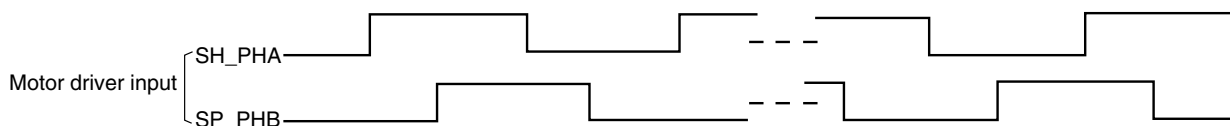
This circuit produces the print timing and drive time from LSI, drives the head magnet that corresponds to HEAD 1~24 with HD01-24-P signal and HDCOM1~8 - P signal and prints.

As the print head is dispersed and allocated in each group, the eight groups are controlled individually.

### 2.2.5 Spacing

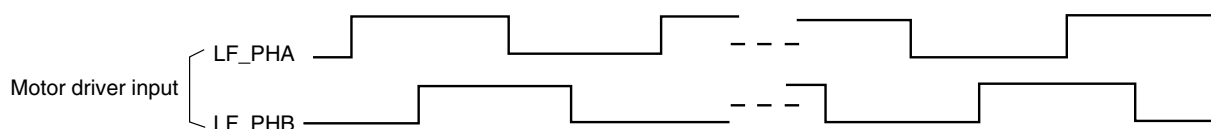
The LSI (MG74Q514-131) outputs space motor phase signals (SP\_PHA, SP\_PHB) when it receives a spacing command from  $\mu$ CPU. It outputs IPT signals as the dot timing and carriage position detection timing in sync with these phase signals.

The space motor phase signals (SP\_PHA, SP\_PHB) are input to the motor driver, which drives the space motor.



### 2.2.6 Line feed

The LF motor phase signals (LF\_PHA, LF\_PHB) from LSI (MG74Q514-131) are input to the motor driver, which drives the LF motor.



### 2.2.7 Alarm circuit

#### (1) High-temperature head alarm

The temperature of the head is monitored by a thermistor embedded in the head to protect the head coil.

The head temperature will rise after continuous heavy-duty print jobs. Therefore, when the head rises beyond a specified temperature, a thermal alarm mode will be entered, and after the current line is printed, the speed for printing the following lines will be decreased. Furthermore, if the head temperature does not fall, the following lines will be divided into two depending on the temperature, and printed by single-direction print.

The alarm is detected when the resistance of the thermistor decreases from the rise in the head temperature and CPU is input in the A/D converter.

### 2.2.8 Paper-end detect circuit

When paper runs out, the photosensor (PE) goes High level and the paper-end signal becomes 1. This signal is input in CPU which goes on the B lamp.

### 2.2.9 Power source unit

The power source unit supplies DC+35V and +5V to each section by switching power.

## 2.3 Mechanical Operation

### 2.3.1 The Printhead Mechanism and Its Operation (see figure 2)

The print head is spring-loaded, utilizing a permanent magnet, and can be easily removed or installed. The print head is mounted on a carriage that runs parallel to the platen and is connected with the control circuit via the head board.

The print head consists of:

- (a) Wire guide
- (b) Print wires
- (c) Armature assembly
- (d) Yoke
- (e) Springs
- (f) Spacer
- (g) Magnet assembly
- (h) Thermistor
- (i) Printed-circuit board

#### (1) Print head operation

When the print head is in the non-printing state, each armature is attracted by the permanent magnet, and the springs holding the armatures are compressed by the thickness of the spacer. The print wires, which are fastened to the individual armatures, are therefore held retracted within the wire guide.

When signals corresponding to a character to be printed are detected by the control circuit, currents flow through the corresponding coils to nullify the magnetic flux generated by the permanent magnet between the armatures corresponding to those coils and the permanent magnet pole. As a result, those armatures are driven toward the platen by the force of the armature springs, and the print wires fastened to those armatures eject from the tip of the wire guide and strike the paper through the ribbon to print dots on the paper.

After the character is printed, the magnetic flux of the permanent magnet attracts the armatures again so that the print wires retract into the wire guide.

The print head has a built-in thermistor to prevent the coils from overheating and burning due to continuous bi-directional printing over a long period. If the coil temperature exceeds the limit (approximately 100 degrees C), the control circuit detects the thermistor signal and stops the printing operation until the coil temperature drops below the limit.

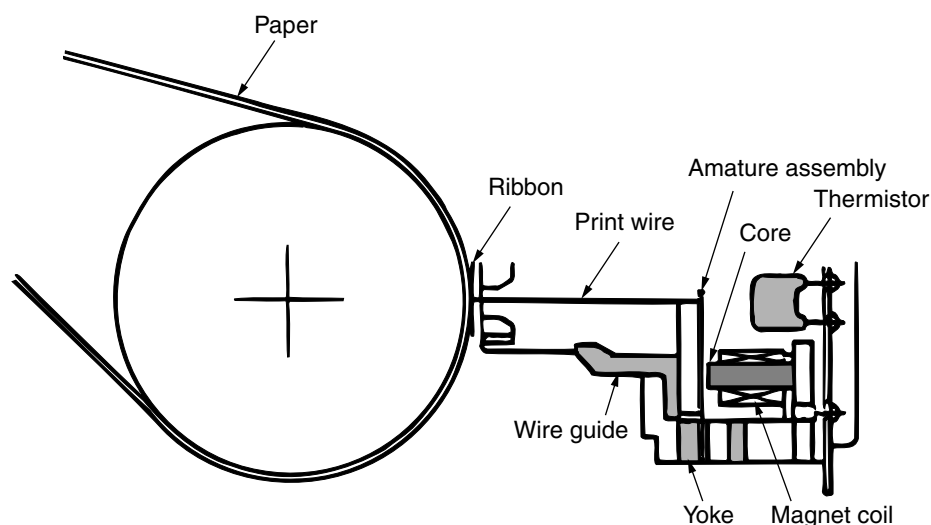


Figure 2

### 2.3.2 Mechanism and operation of space (see figure 3)

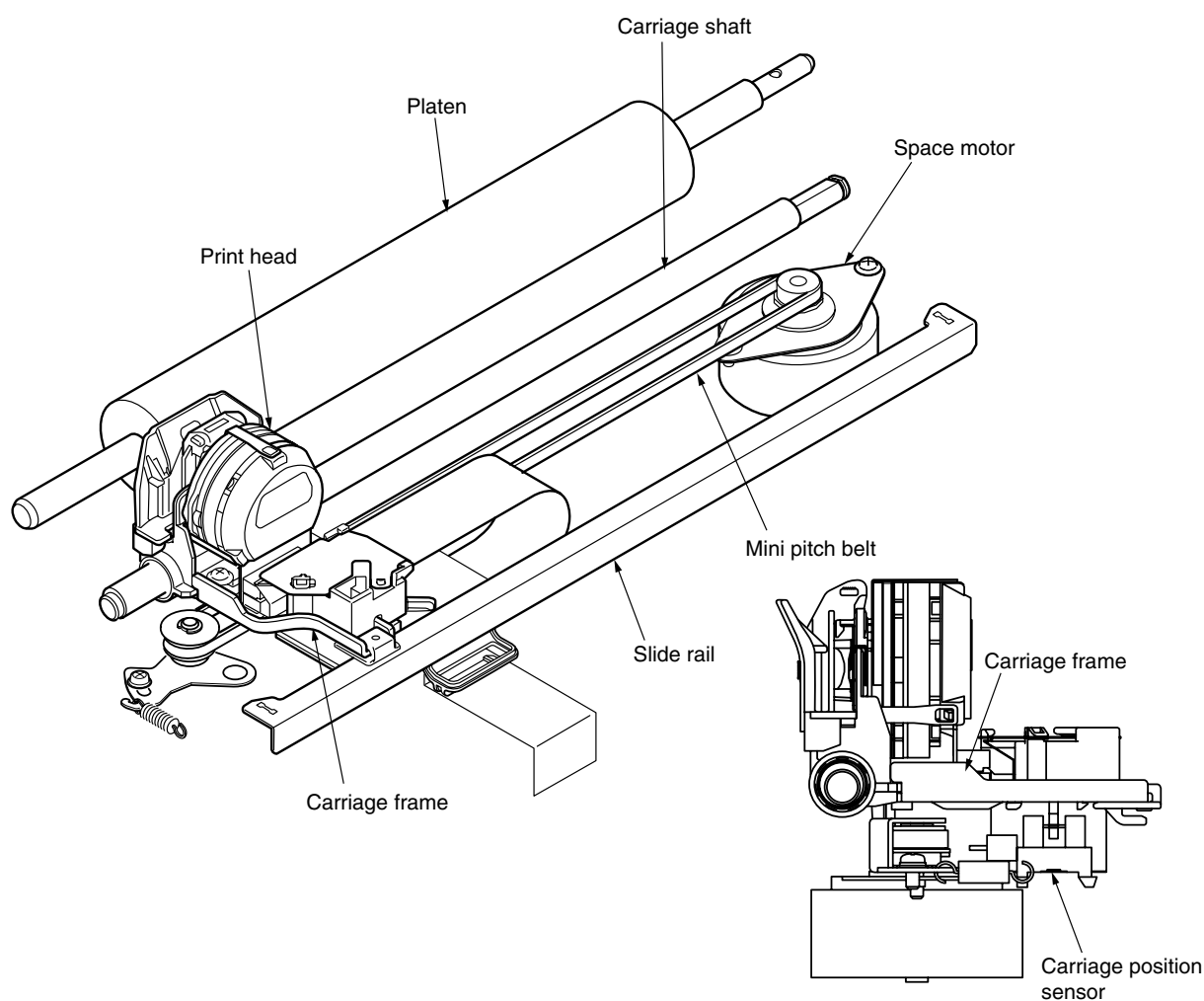
The space mechanism of printers consists of several parts, including a carriage shaft placed parallel to a platen and a carriage frame that moves along the carriage shaft. The space mechanism is driven by a space motor located behind the carriage frame.

The space mechanism consists of:

- (a) Stepping motor with motor gear
- (b) Carriage frame
- (c) Carriage shaft
- (d) Carriage position sensor
- (e) Slide rail

#### (1) Spacing operation

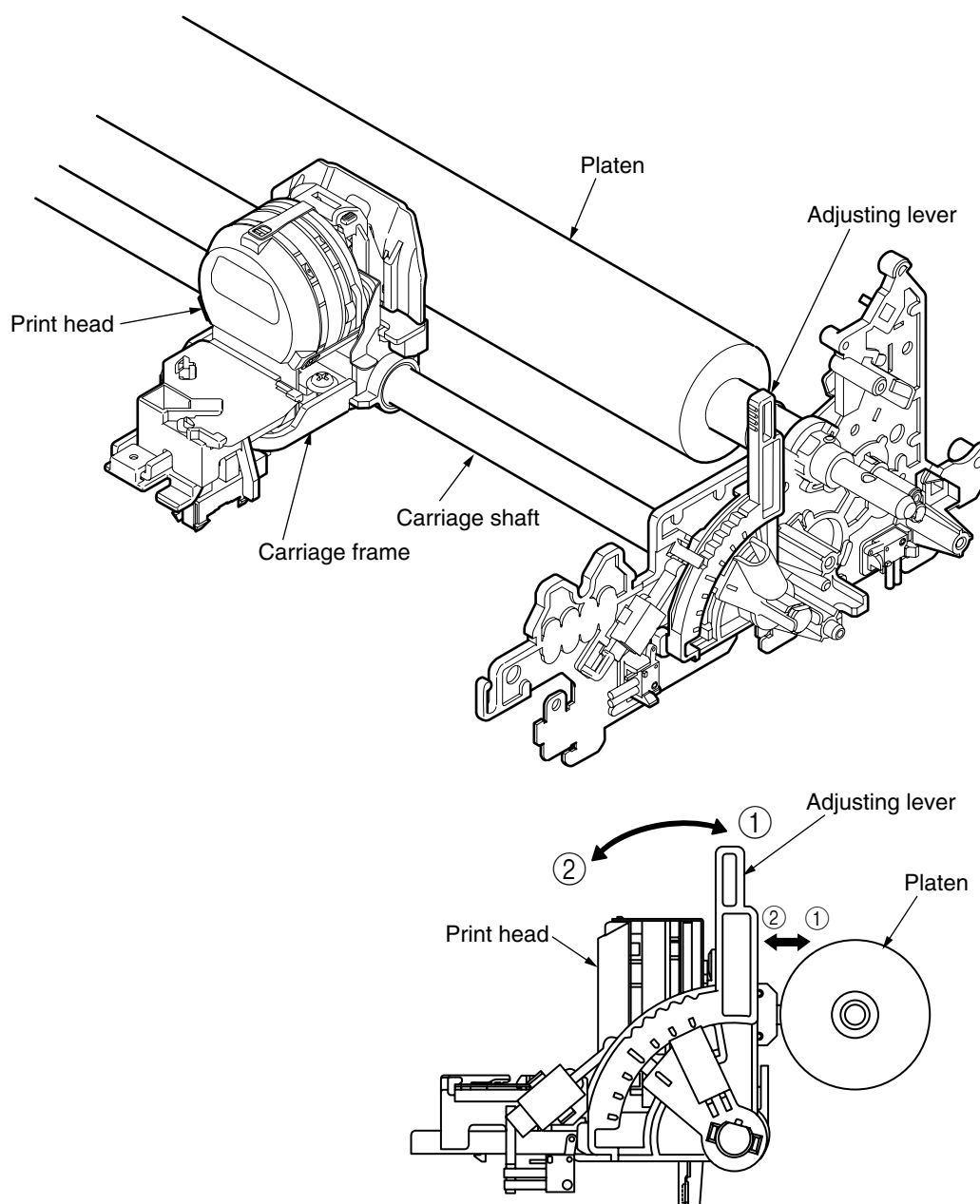
A carriage carrying a print head moves on its shaft parallel to a platen. As a space motor revolves, the power of the space motor is transferred to a mini pitch belt. This completely moves the carriage. The position of the carriage frame is detected by the left-hand carriage position sensor.



**Figure 3**

### 2.3.3 Mechanism for adjusting the head gap (see figure 4)

The head gap adjustment is a mechanism to correct the gap between the print head and platen by moving the adjust lever vertically and rotating and moving the carriage shaft toward and away. The movement of the adjust lever rotates the carriage shaft that is connected directly to the adjust lever. The carriage shaft is decentered against the fulcrum of the adjust lever (section fit with the carriage shaft), therefore, the carriage shaft moves toward and away when the adjust lever rotates. The print head then moves toward and away the platen.



**Figure 4**

#### 2.3.4 Mechanism and operation of ribbon feed (See figure 5)

Ribbon feed is a mechanism to feed the ribbon which is driven by the stepping motor.

The ribbon feed mechanism consists of:

- (a) Ribbon feed gear assembly
- (b) Ribbon cartridge

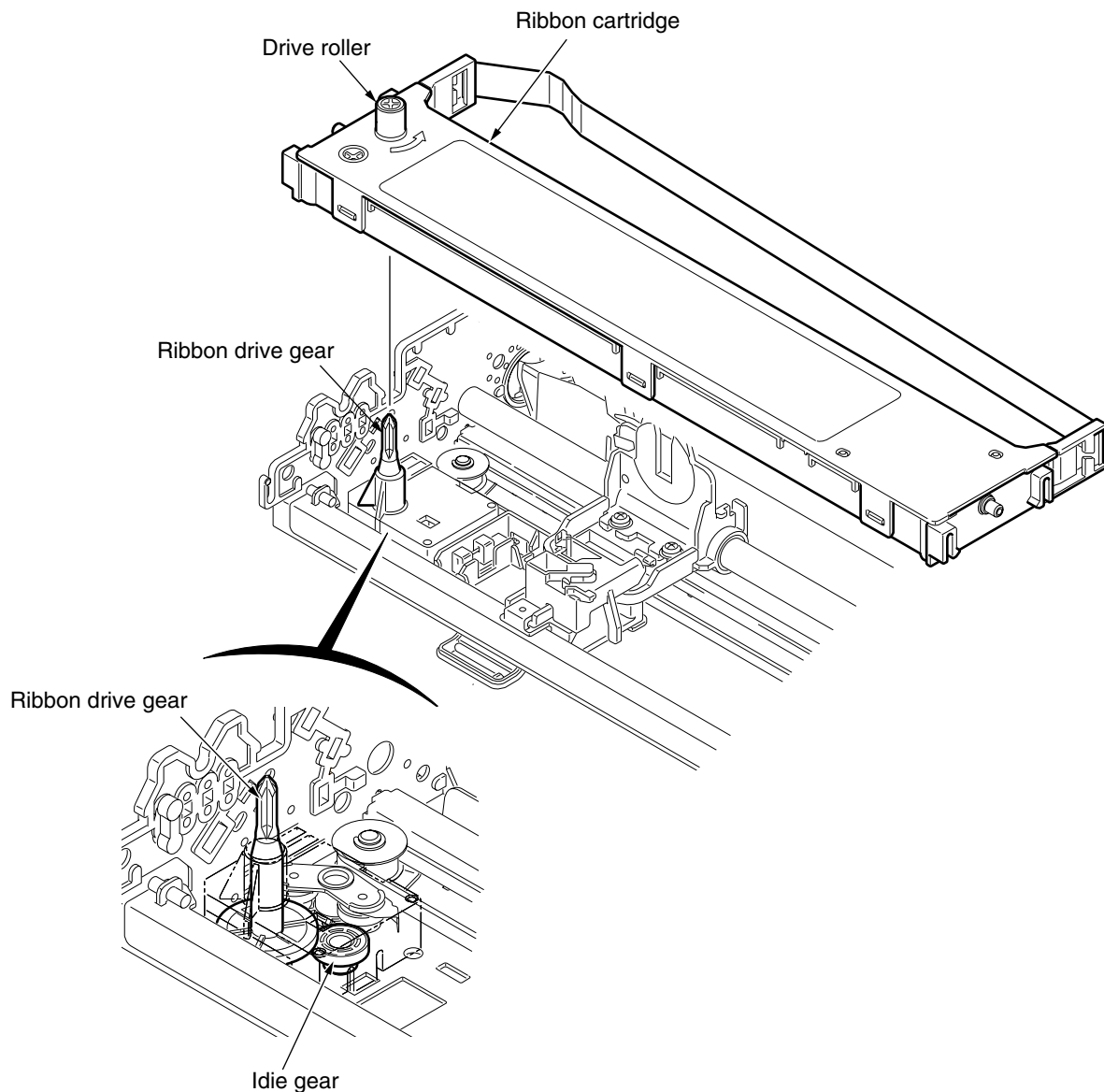
##### 1) Ribbon cartridge

The use of a one-way feed endless ribbon provides clear print results.

##### (2) Feed operation

Ribbon feed is initiated at the same time the spacing operation is initiated regardless of the mode, and stops when the spacing operation is ceased.

The rotation of a driven stepping motor is transferred to the drive roller in the ribbon cartridge via the ribbon gear which feeds the ink ribbon.



**Figure 5**

### 2.3.5 Paper Feed Operation

Feeding of the paper is performed by turning the platen and the pin tractor, which is driven by the LF stepping motor.

Item of the paper feed mechanism are as follows:

- (a) Stepping motor with gears
- (b) Decelerating gear
- (c) Platen
- (d) Tractor feed unit
- (e) Pressure roller



## (1) Cut sheet and continuous sheet switching mechanism (See Figure 6.)

Three different paper paths can be selected and set by the change lever.

(a) **TOP** (Cut-sheet mode)

To use cut-sheet paper in manual mode, turn the change lever to the “TOP” position to enter cut-sheet mode.

## [Operation]

Turning the change lever to the “TOP” position moves the change gear and disengages this component from the tractor gear.

Driven by the LF motor, the idle gear rotates and transmits this rotation to the platen gear.

The pressure rollers (front/rear) are pressed to the platen to feed the cut-sheet paper.

At the same time, the change lever activates “TOP-REAR\_SW,” conveying to the control board that the change lever is in the top position and that the cut-sheet mode is selected.

In cut-sheet mode, after paper has been set in position and the specified time stored in the menu has elapsed, the paper is fed automatically into the start position.

(b) **REAR** (Continuous-form: The push tractor is placed in the rear.)

When the change lever is in the rear position, the change gear is engaged with the tractor gear and the rotation of the LF motor is transmitted to the tractor gear via the idle gear and the change gear.

The rotation of the tractor gear rotates the tractor shaft, which in turn feeds the continuous-form set in the push tractor.

At the same time, the change lever turns off “TOP-REAR\_SW,” conveying to the control board that the change lever is in the rear position and that continuous-form mode is selected.

(c) **BOTTOM** (Continuous-form: The tractor is placed above the platen.)

The rotation of the LF motor is transmitted to the tractor gear via the idle gear, the platen gear, and the pull-up gear.

The rotation of the tractor gear rotates the tractor shaft, which in turn feeds the continuous form set in the pull tractor.

At the same time, the change lever turns off “TOP-REAR\_SW,” conveying to the control board that the change lever is in the rear position and that continuous-form mode is selected.

## Correlation in Mechanism

Mechanism Lever Position	Top Rear change Switch	Idle Gear	Change Gear	Tractor Gear	Sheet Insertion
TOP	OFF	Rotate	Rotate	Stop	Manual/ automatic
REAR	ON	Rotate	Rotate	Rotate	• Operation SW or • instruction
BOTTOM	OFF	Rotate	Rotate	Stop	• Operation SW or • instruction

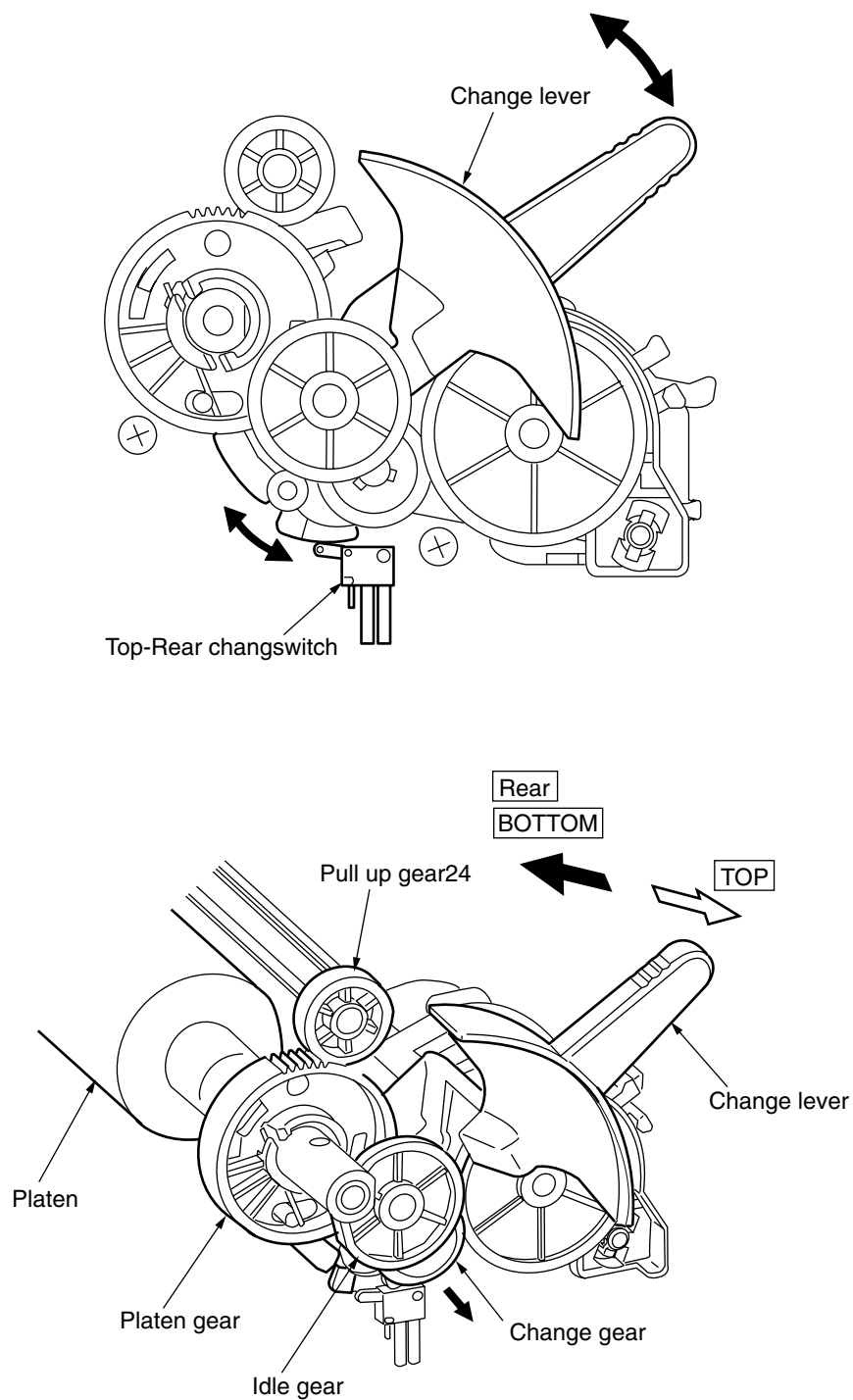
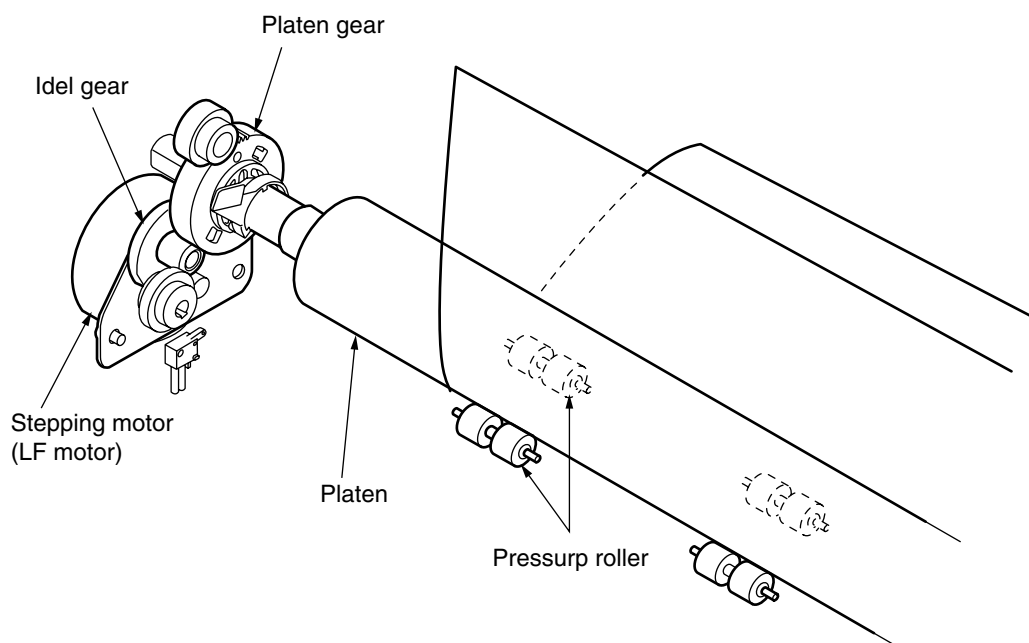


Figure 6

(2) Cut-sheet feeder operation (See Figure 7.)

The pulse motor used for the paper feed mechanism is mounted on the left of the frame, and the rotation of the motor is transmitted through decelerating gears (LF idle gear, platen gear) to the platen. When using cut-sheet paper, the change lever must be in the TOP position to grab the paper, while disengaging the push tractor.

When the change lever is set to the TOP position, the cut sheet is automatically fed in up to the print start position after pausing for the wait time stored in the menu.

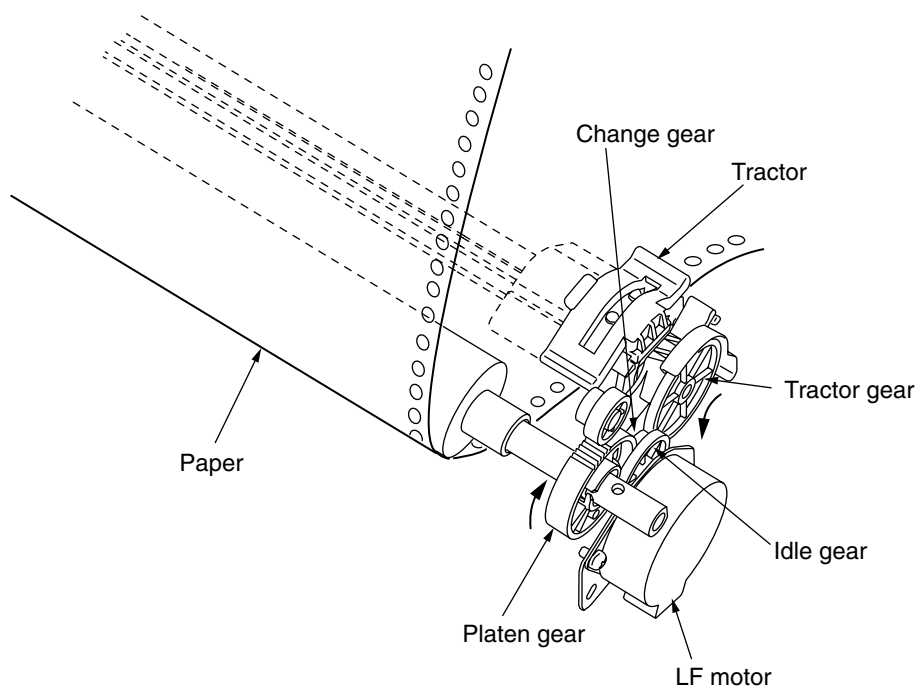


**Figure 7**

## (3) Continuous paper feed operation (Rear) (See Figure 8.)

The force transmitted to the platen, rotates the tractor gear through platen gear, the idler gear and the change gear. The rotation of the tractor gear makes the pin tractor belt rotate through a sheet feeder shaft, feeding the continuous paper.

## Pin wheel Tractor Type



## Belt Tractor Type

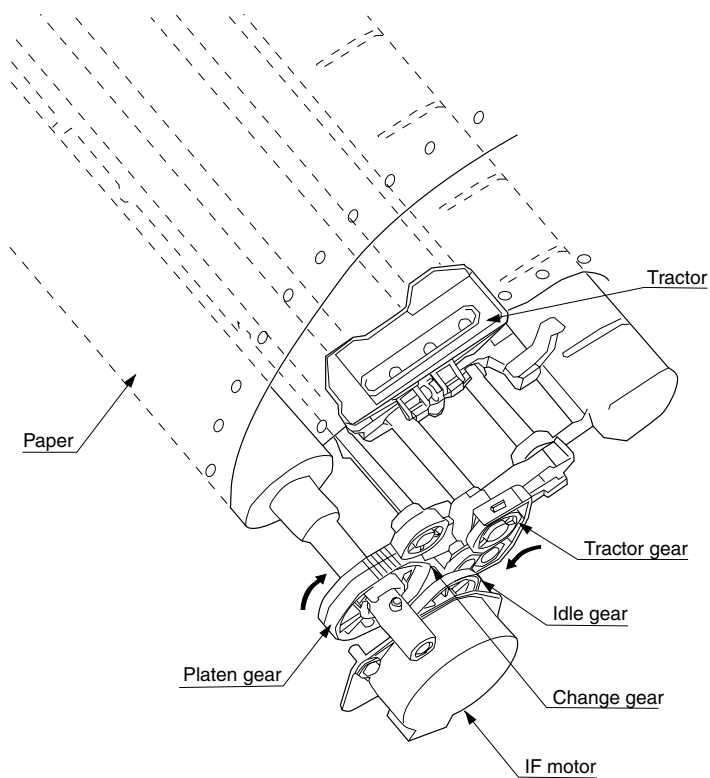


Figure 8

## (4) Bottom push feed operation (See Figure 9.)

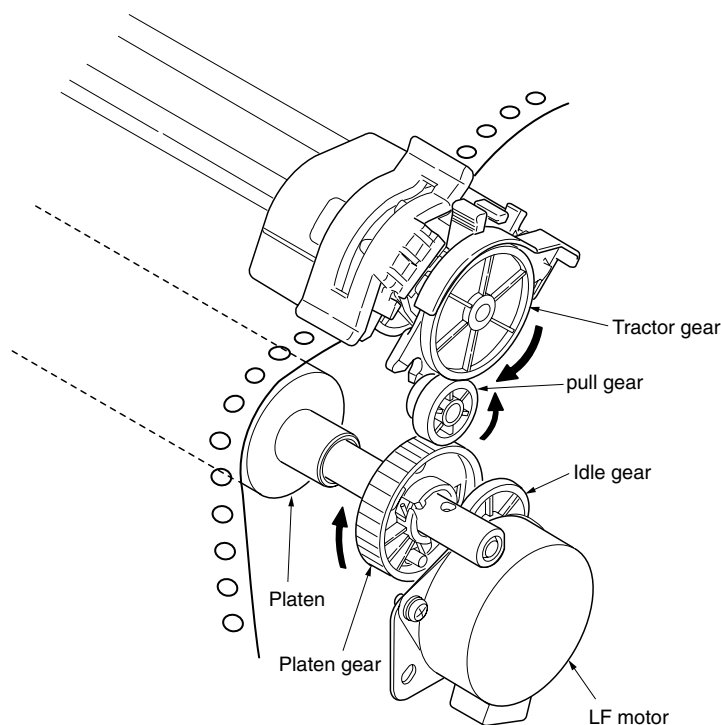
Remove the pull-up assy.

By removing the tractor assy. installed in the rear and installing it above the platen, the assy. is used for bottom pull feed.

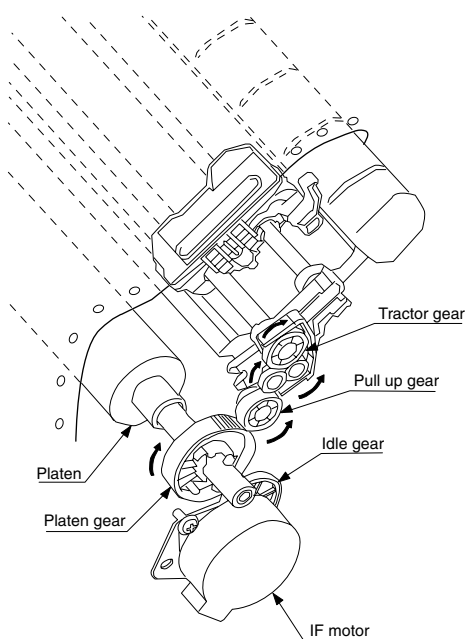
The rotation of the LF motor is transmitted via the platen gear and the pull-up gear and rotates the tractor gear.

The rotation of the tractor gear rotates the tractor shaft, which in turn feeds the continuous form set in the tractor assy. into the print start position.

## Pin wheel Tractor Type



## Belt Tractor Type



**Figure 9**

(5) Paper clamp mechanism (See Figure 10.)

When setting the change lever to the TOP or REAR, BOTTOM position, the operation of the front release gear arm changes according to the position of the release cam. And at the same time, the position of the cam installed to the front release gear shaft changes, and the open and close of the pressure roller.

Position of change lever	Open or close of front pressure roller	Open or close of rear pressure roller
BOTTOM/REAR	OPEN	OPEN
TOP	CLOSE	CLOSE

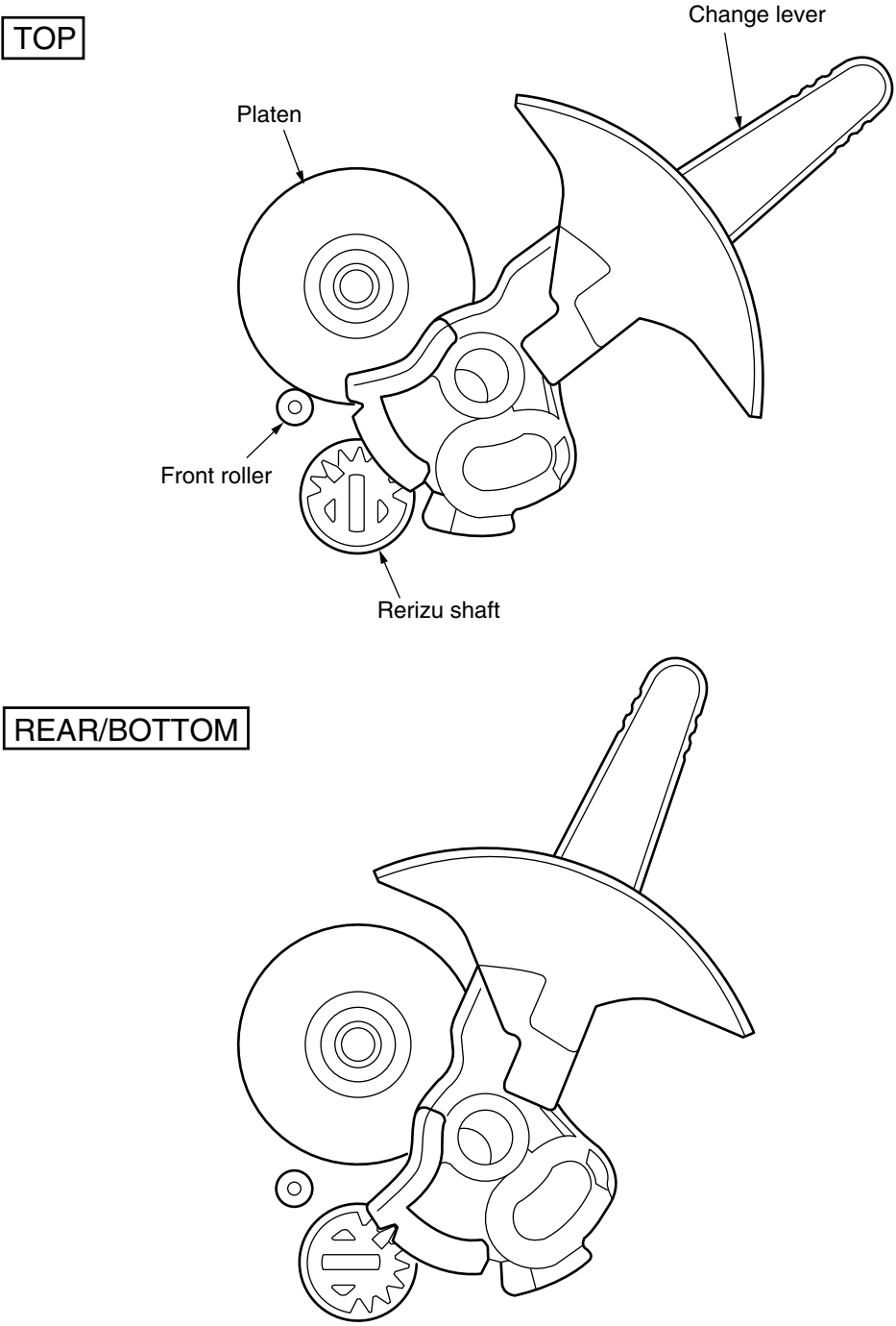
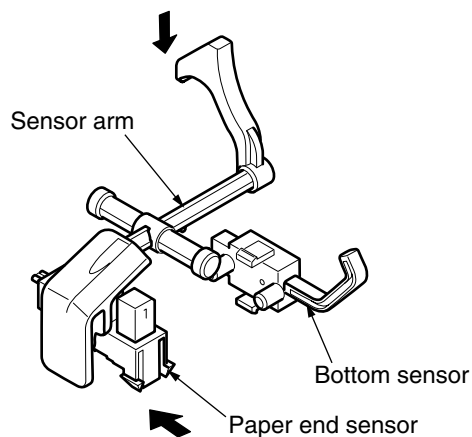


Figure 10

### 2.3.6 Paper Detection Mechanism

#### (1) Cut sheet detection/Rear feed detection(See Figure 11.)

When a cut sheet is inserted or a continuous form is fed by the tractor, the sensor arm is pushed down by the paper and rotated. This moves the end of the sensor arm away from the paper sensor that it has blocked, and the paper sensor detects "ON."



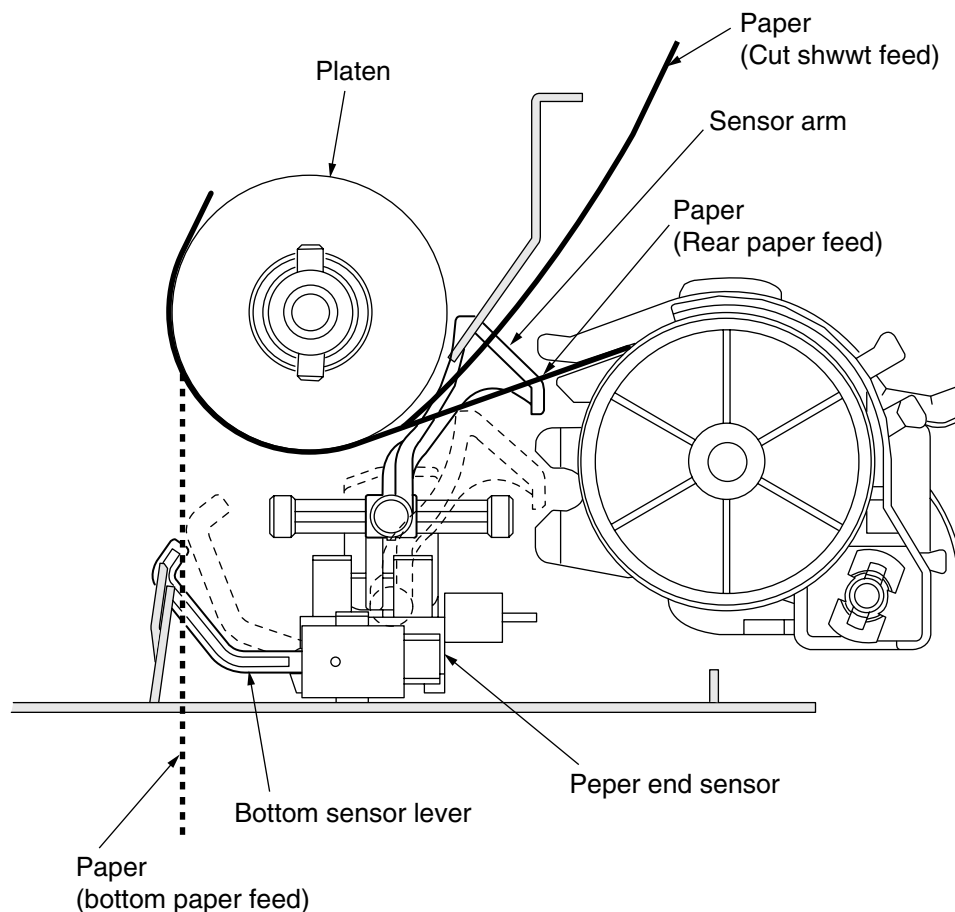
**Figure 11**

#### (2) Bottom feed detection(See Figure 12.)

When paper is fed from the bottom, the bottom sensor lever is pushed down by the paper and the bottom sensor detects "ON."

When the tail end of paper has passed the bottom sensor, the sensor lever returns into position and the bottom sensor detects "OFF."

Pin wheel Tractor Type



## Belt Tractor Type

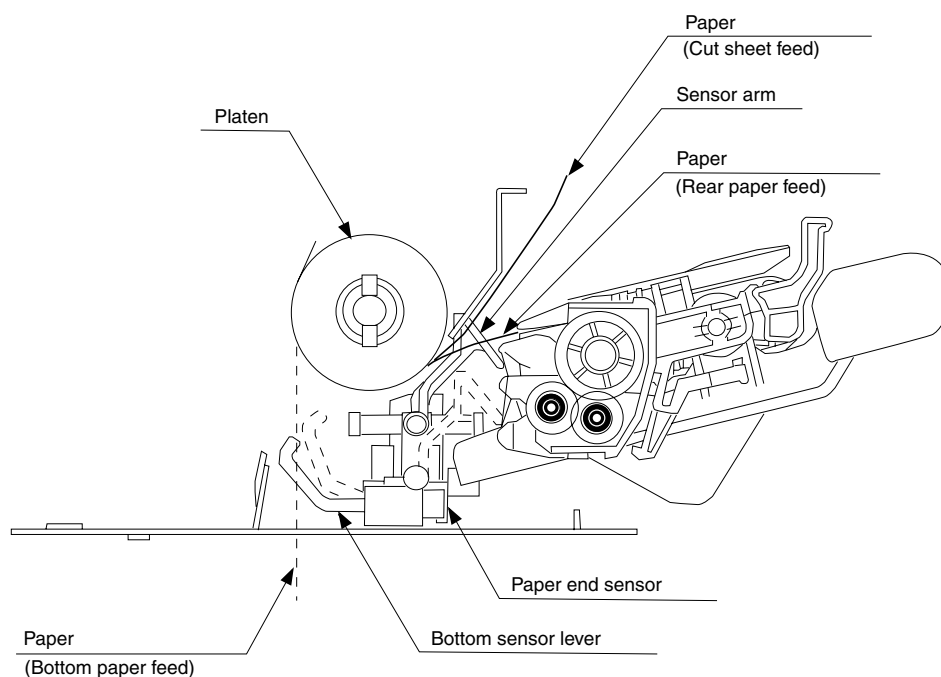


Figure 12

## (3) Top line print mechanism (See Figure 13.)

The front edge of the sheet is protected by the ribbon protector so that it can stop at a position just near to the print head (0 tear off position) to start printing at the front end of the sheet, without causing the sheet to crumple or curl up.

The printing starts at the front end of the sheet, and continues uni-directionally until the front end of the sheet gets to the inside of the pull up roller cover.

After that, that printing continues bi-directionally.

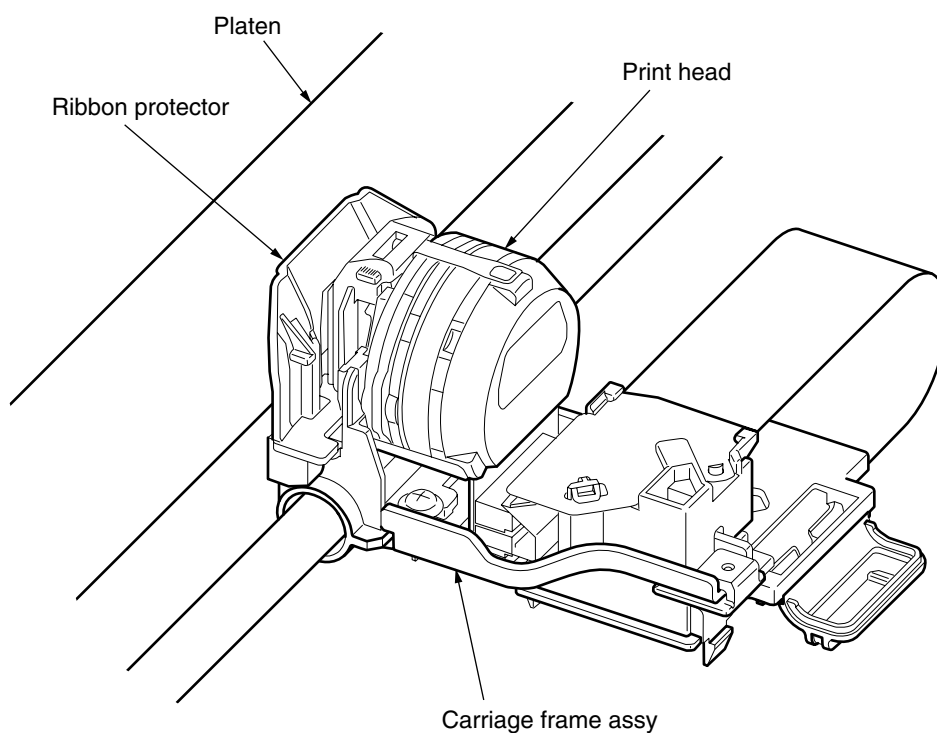


Figure 13



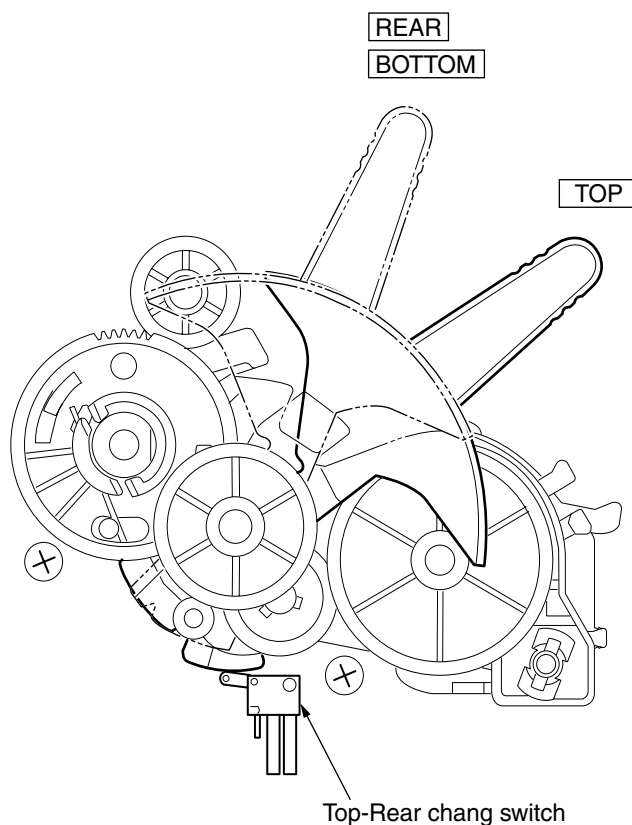
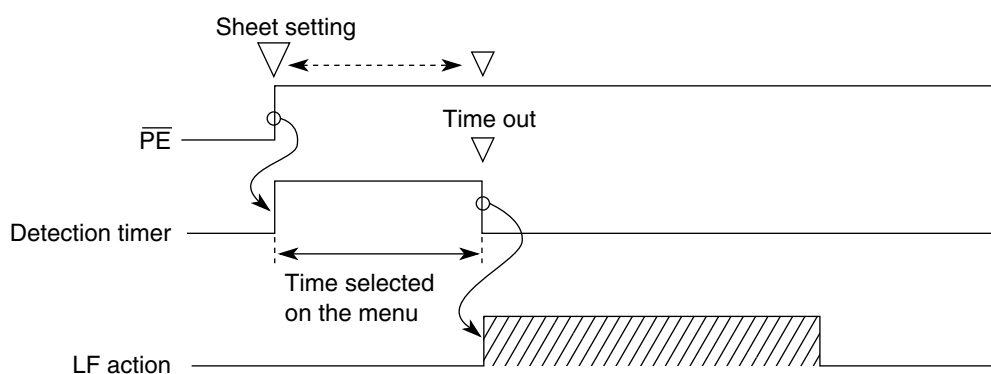
### 2.3.7 Automatic Sheet Feed (See Figure 14.)

This function is used to feed in the sheet automatically up to the print start position when the cut sheet or the continuous sheet is used.

[Operational procedure]

(1) When using the cut sheet

- 1) Set the change lever to the **TOP** position. (See Figure 14.)
- 2) Insert a sheet of paper between the platen and the paper shoot.
- 3) After the lapse of time selected by the “wait time” in the menu, the LF motor starts its operation to feed the sheet of paper up to the print position.
- 4) When the default is selected, the sheet of paper is feed in up to the position 0.85 inches (first dot position) from the upper end of the sheet. However, the 0 tear off mechanism allows the printing at the front end of the sheet by changing the TOF position.

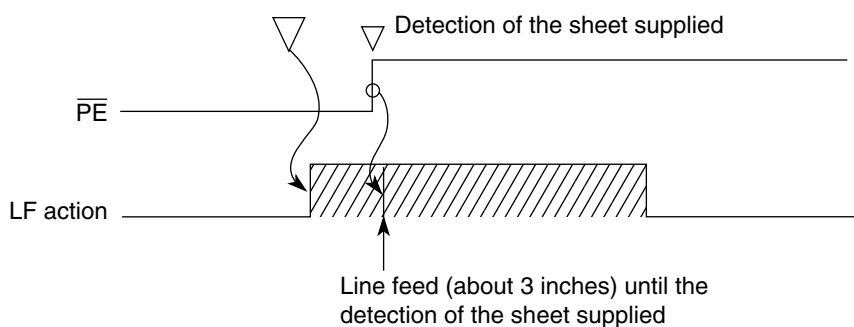


**Figure 14**

## (2) When using the continuous paper

- 1) Set the change lever either to the rear side or the bottom side position. (See Figure 14.)
- 2) Set a sheet of paper either to the push tractor or the bottom tractor.
- 3) Press the "FF/LOAD" switch.
- 4) The LF motor starts its operation to feed the paper up to the print start position.
- 5) The paper is fed in up to the TOF position (Factory default: 0.85 inches from the top).

Push down the "FF/LOAD" switch.



When the "FF/LOAD" switch is pushed down, the LF motor feeds in the sheet about 3 inches. When the LF motor completes the operation and the sheet has not been fed in, the feeding operating operation becomes, ineffective, thus resulting in the feeding jam.

### 2.3.8 Paper Park Function (Continuous paper)

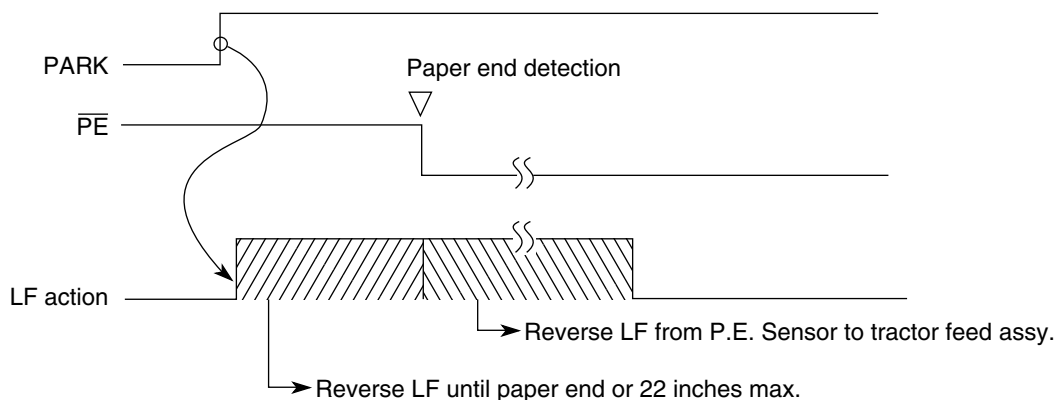
Continuous sheets which have been inserted can be reversed automatically by using the “PARK” button on the operation panel.

- 1) Press the “PARK” button on the operation panel.
- 2) Reverse LF is started and paper is fed in reverse until paper end occurs or 22 inches maximum have been fed.
- 3) The paper is fed in reverse, to leave the paper on the push-tractor.

Alarm LED lights up when P.E. is not detected after 22 inches reverse feeding.

Operator can press SEL key to turn off the ALARM LED then press PARK key to continue park function.

This operation is required when the length of paper for parking is more than 22 inches.



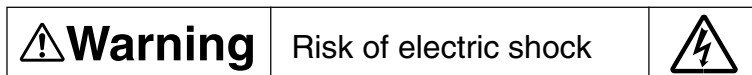
### 3. ASSEMBLY/DISASSEMBLY

This section explains the procedures for removing and installing various assemblies and units in the field.

Description is mainly limited to the removal procedure; installation should basically be performed in the reverse sequence of the removal procedure.

#### 3.1 Precaution for Parts Replacement

- (1) Remove the AC cable and the interface cable before disassembling or assembling.
  - (a) Turn off the AC power switch. Remove the AC input plug of the AC cable from the receptacle. Remove the AC cable from the inlet on the printer.

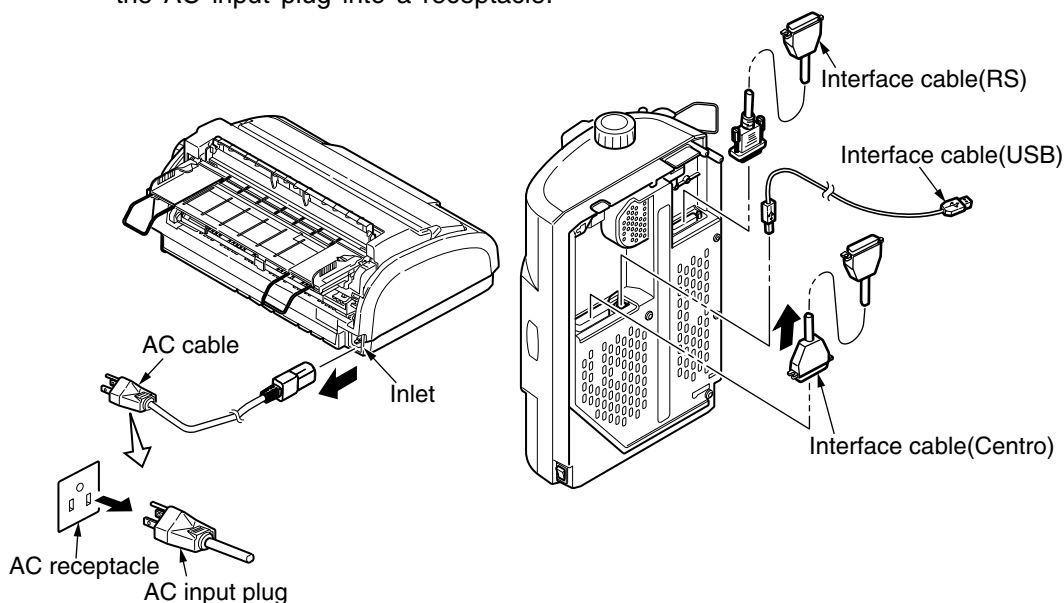


There is a risk of electric shock during replacement of the power supply.

Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cable is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

- (b) To connect the AC cable again, connect it to the inlet on the printer first, then insert the AC input plug into a receptacle.

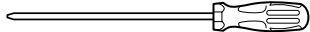







- (2) Do not disassemble the printer as long as it is operating normally.
- (3) Do not remove unnecessary parts, and limit the disassembly area as much as possible.
- (4) Use the designated service tools.
- (5) Carry out disassembly in the prescribed sequence; otherwise, damage to the parts may result.
- (6) It is advisable to temporarily install screws, snap rings and other small parts in their original positions to avoid losing them.
- (7) Whenever handling the microprocessors, ROM, RAM IC chips and boards, do not use gloves which may cause static electricity.
- (8) Do not place the printed circuit board directly on the equipment or on the floor.
- (9) If adjustment is specified in the middle of installation, follow the instructions.

### 3.2 Service Tools

Table 3.1 lists the tools necessary for replacing printed circuit boards and parts of units in the field.

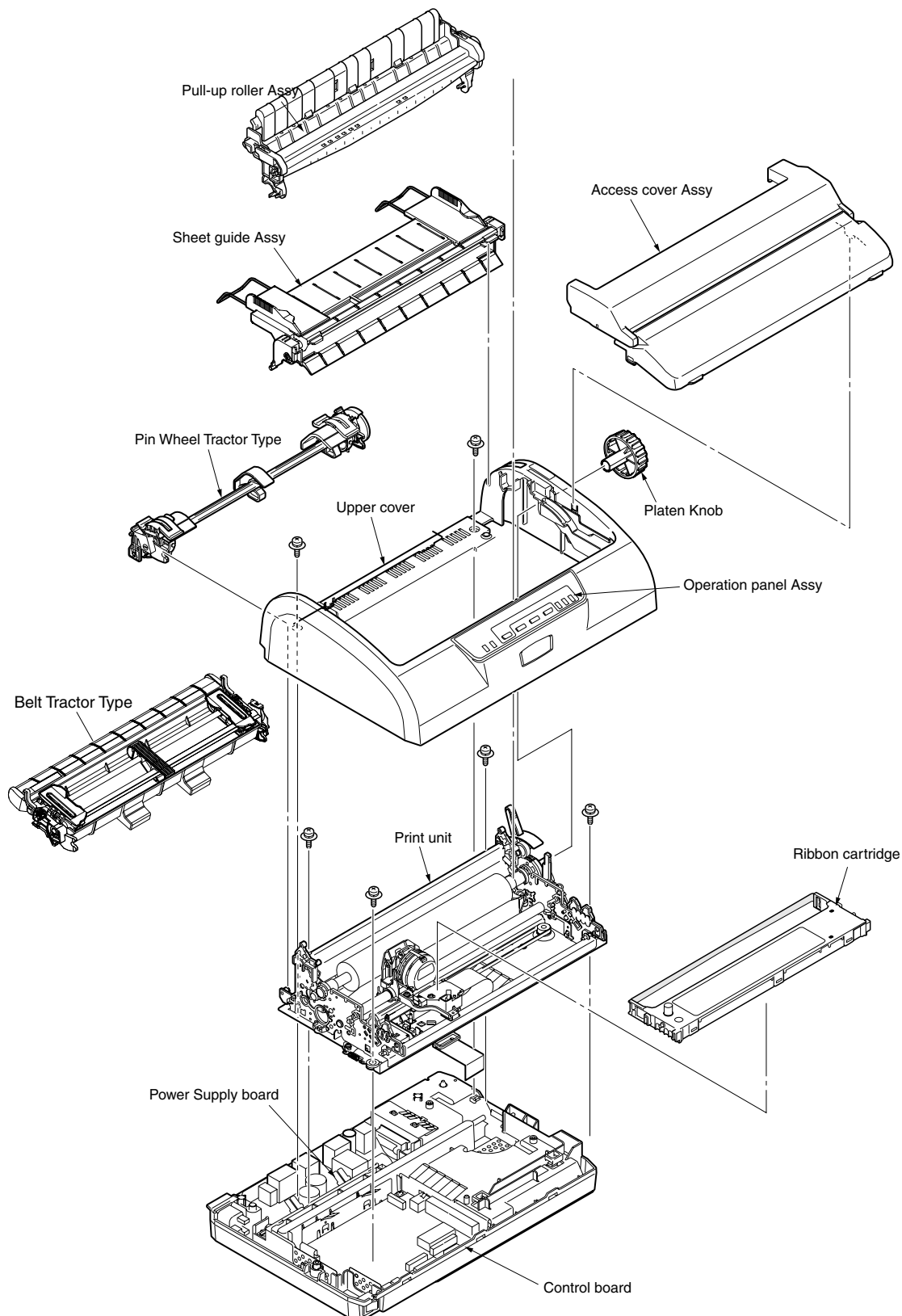
**Table 3.1 Service tools**

No.	Service Tool		Q'ty	Use	Remarks
1		No. 2-200 Phillips screwdriver	1	Screws 3-5 mm	
2		No. 3-100 screwdriver	1		
3		Spring hook	1		
4		Volt/ohmmeter	1		
5		Feeler gauge	1	Head gap adjustment	
6		Pliers	1		

### 3.3 Disassembly/Reassembly Procedure

This section explains the assembly replacement procedures according to the following disassembly system.

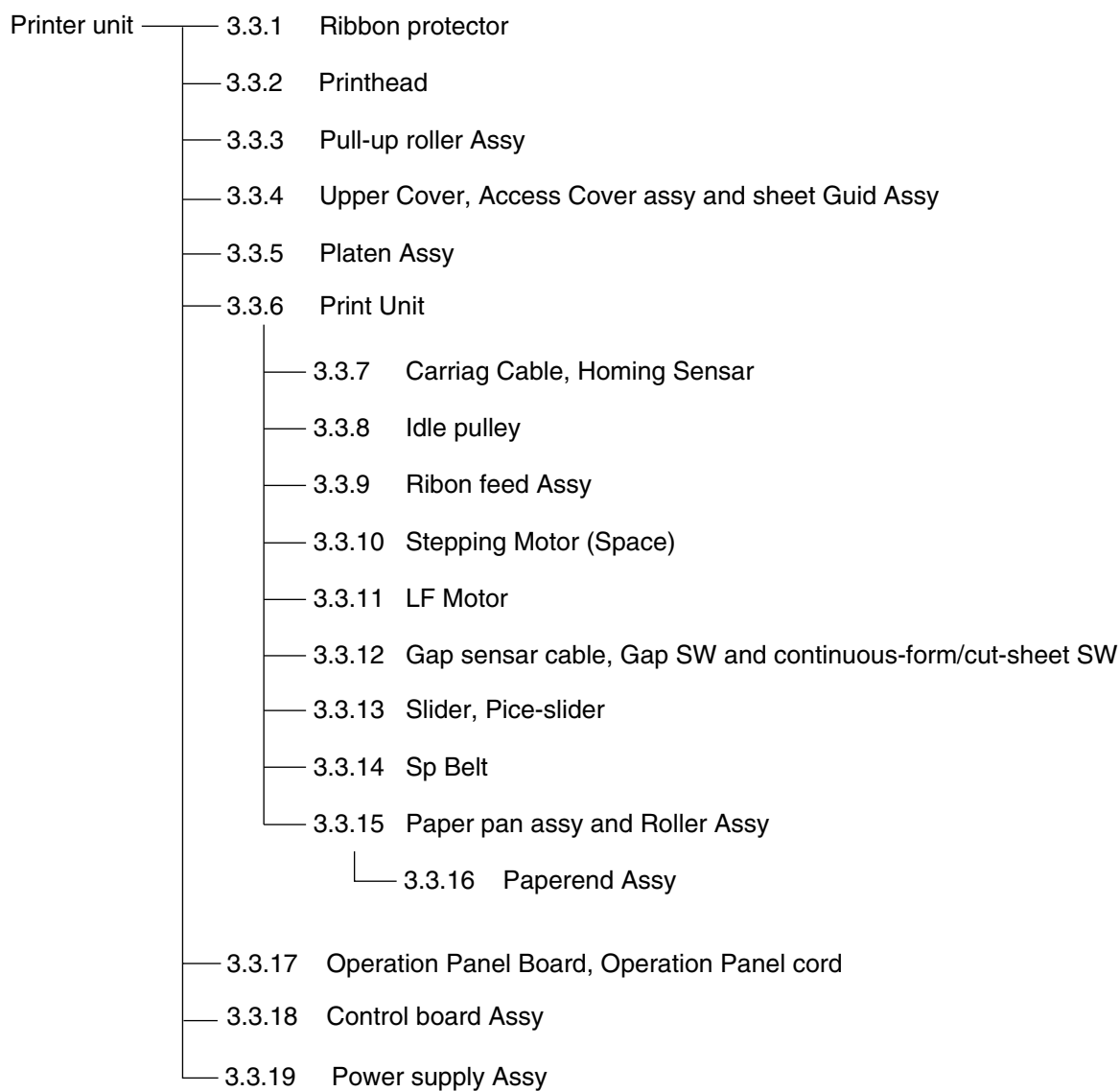
[Parts Layout]



**Figure 3-1 Printer unit**

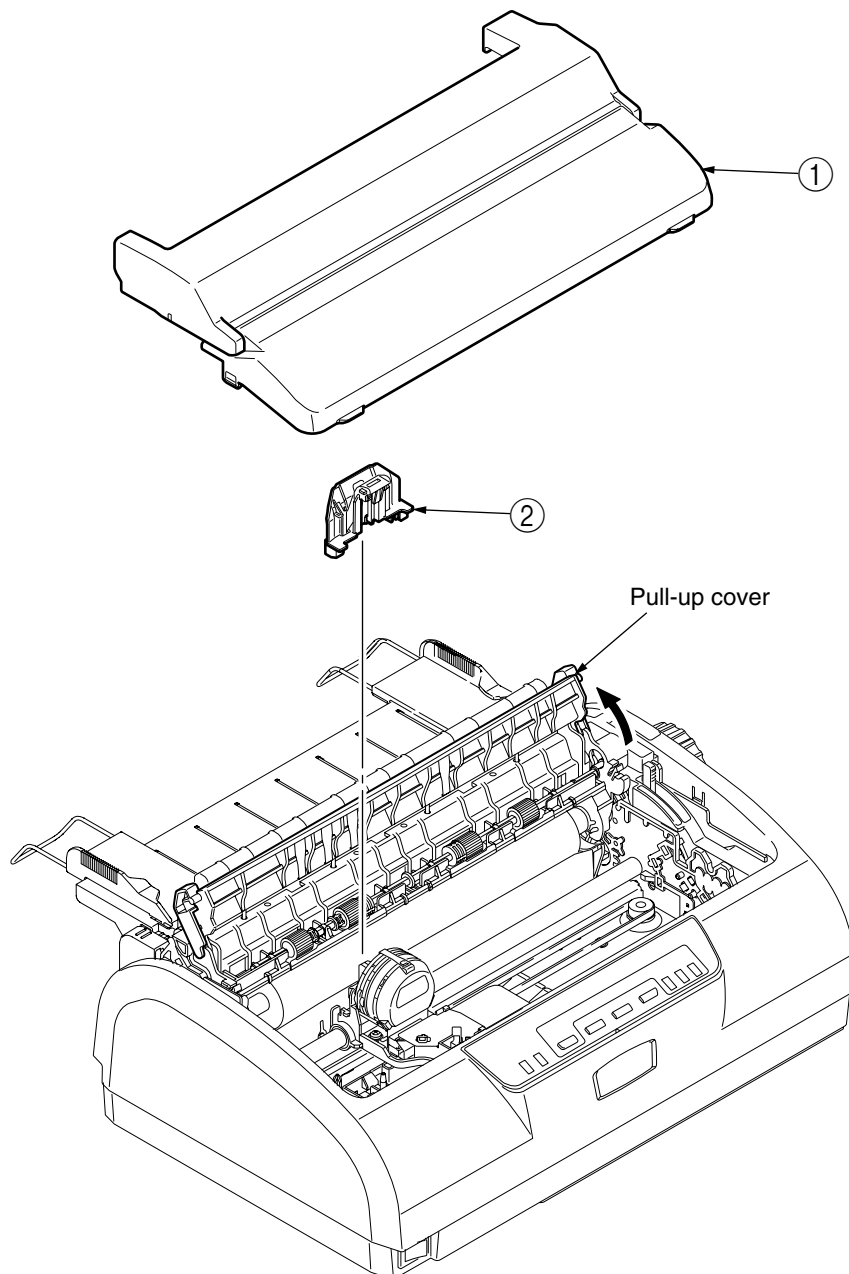
### [How to Change Parts]

This section explains how to change parts and assemblies appearing in the disassembly diagram below.



### 3.3.1 Ribbon Protector

- (1) Open the access cover ①.
- (2) Open the pull-up roller cover.
- (3) Raise and remove the ribbon protector ②.
- (4) Assemble in the reverse order of disassembly.



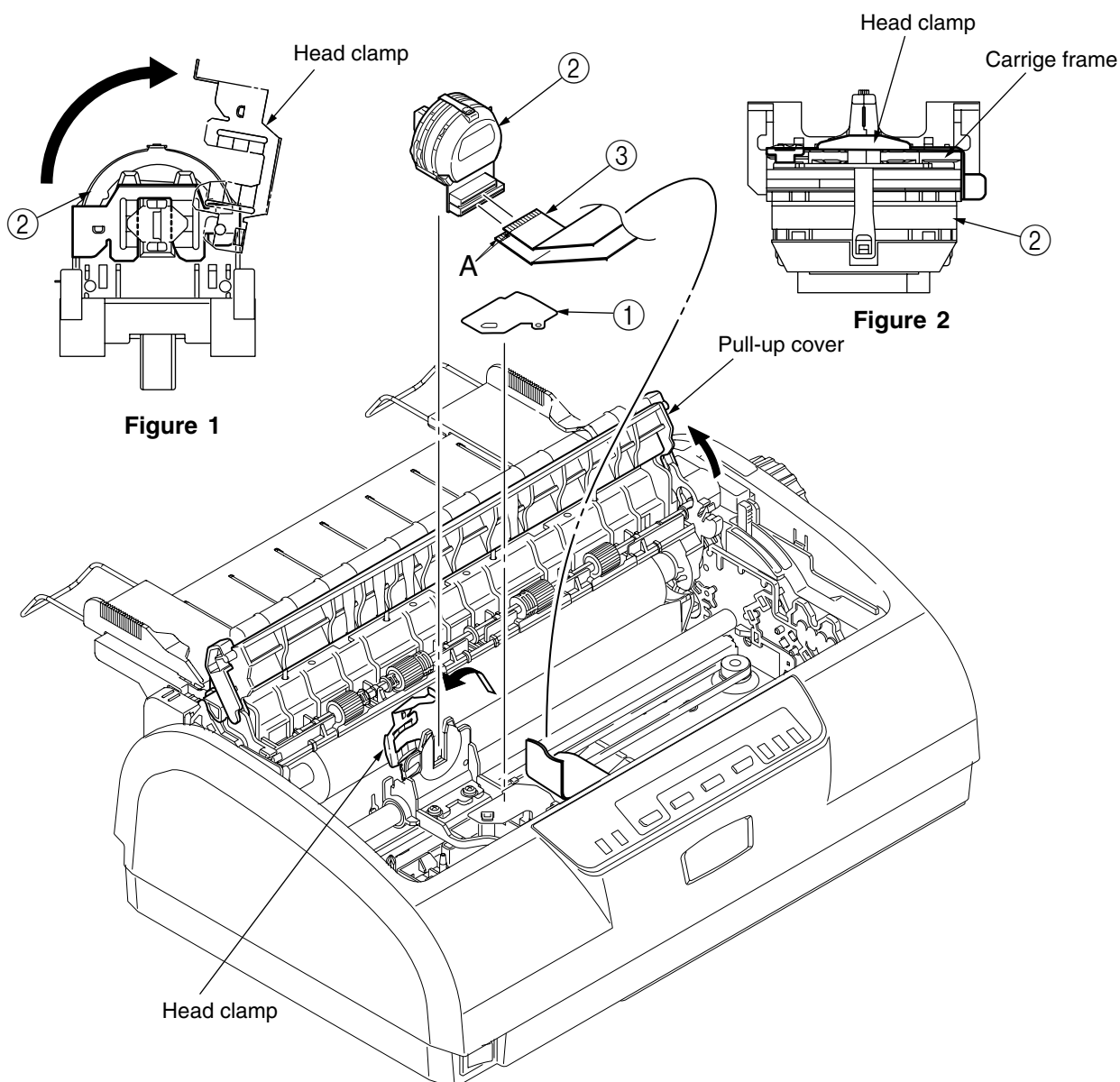


### 3.3.2 Printhead

- (1) Open the access over.(See. 3.3.1)
- (2) Open the pull-up roller cover.
- (3) Remove the cable cover ①.
- (4) Pull up and rotate the head clamp to unclamp the printhead ② as shown Figure 1.
- (5) Disconnect the printhead ② from two carriage cables ③.
- (6) Assemble in the reverse order of disassembly.

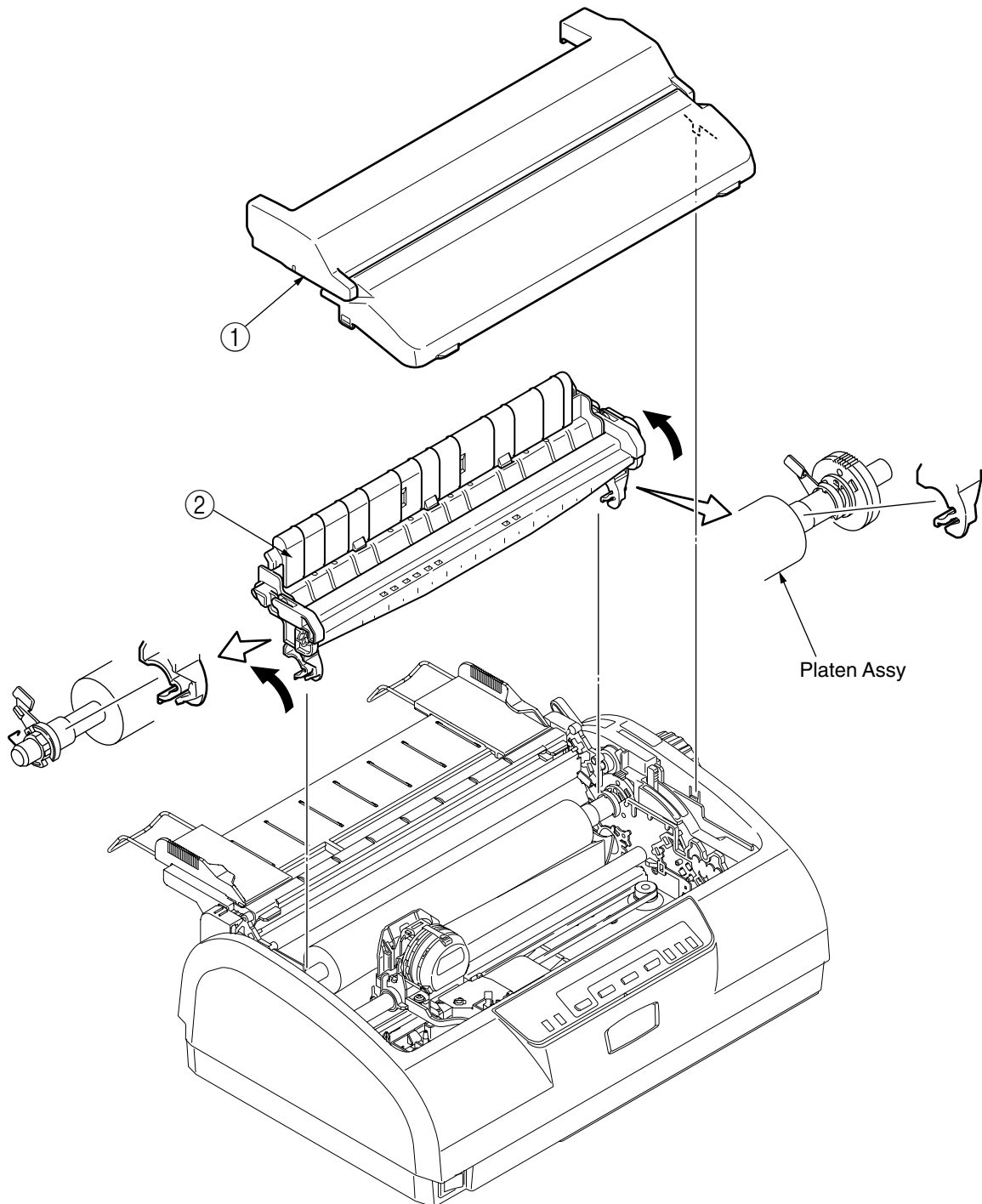
#### Notes :

- (1) Insert the printhead ② into the two Plat cables ③ while pushing it against the carriage frame .
- (2) The head clamp must surely be sandwiched between printhead ③ and carriage frame as shown Figure 2.
- (3) Be sure to check the gap between platen and printhead (see 4).
- (4) Be careful not to touch the print head while it is very hot.
- (5) Make sure that there is not any dust or oil on the connector contact section A. If it is found, wipe it off by alcohol.



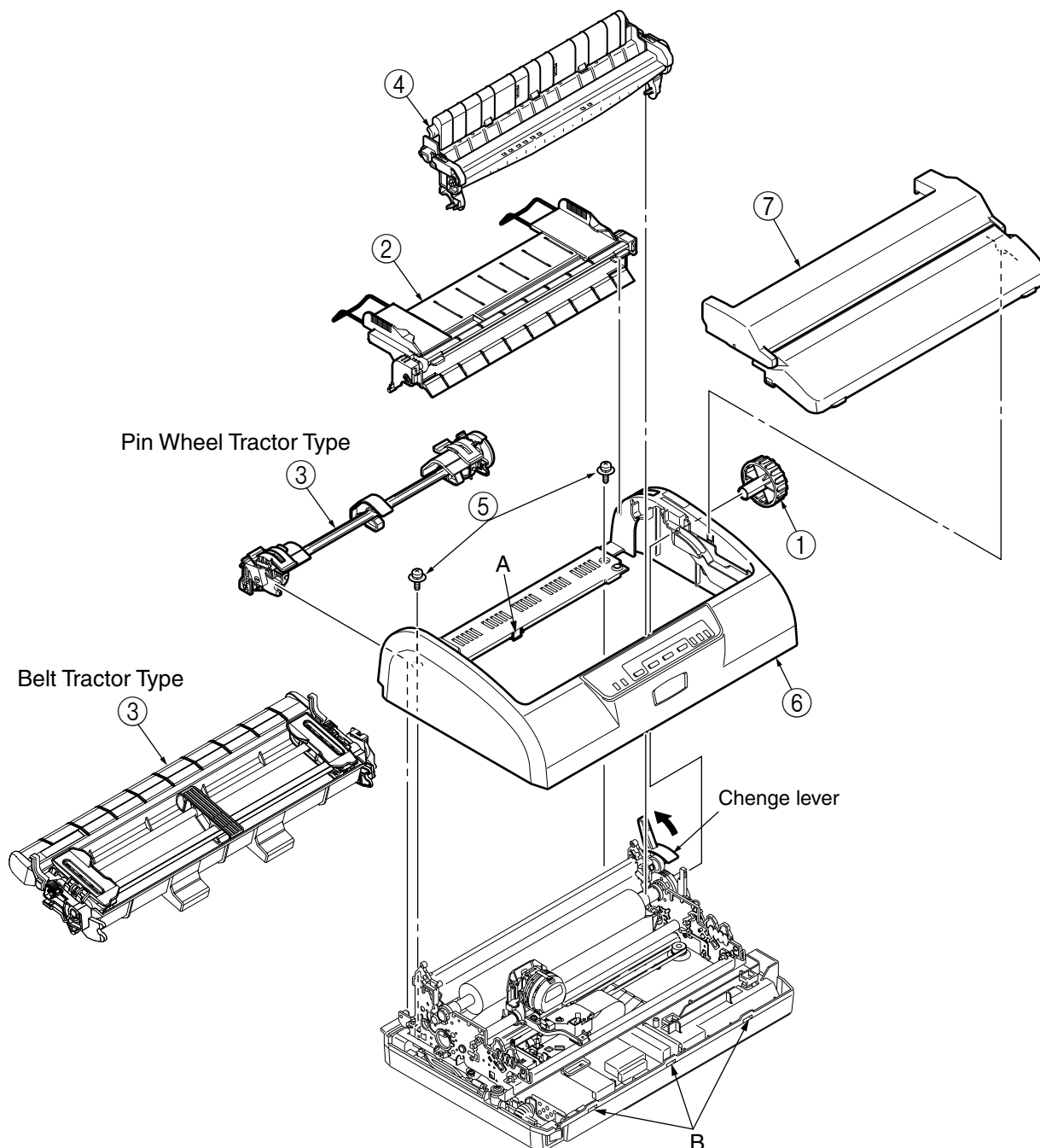
### 3.3.3 Pull-up Roller Assy

- (1) Open the access cover ①.
- (2) Tilting the pull-up roller Assy ② toward the back, remove from the shaft of platen Assy.
- (3) Assemble in the reverse order of disassembly.



### 3.3.4 Upper Cover Assy, Access Cover Assy and Sheet Guide Assy

- (1) Pull off the platen knob ①.
- (2) Turn the change lever toward the top position.
- (3) Remove the sheet guide Assy ②.
- (4) Remove the tractor Assy ③.
- (5) Remove the pull-up Assy ④.
- (6) Remove the two screws ⑤ in the rear.
- (7) Detach the claw (A) at the rear of the upper cover ⑥.
- (8) Insert a flat-blade screwdriver into grooves (3 places (B)) of frame and twist to disengage claws of upper cover ⑥.
- (9) Raise the upper cover Assy ⑥ to remove.
- (10) Remove the access cover Assy ⑦.
- (11) Assemble in the reverse order of disassembly.

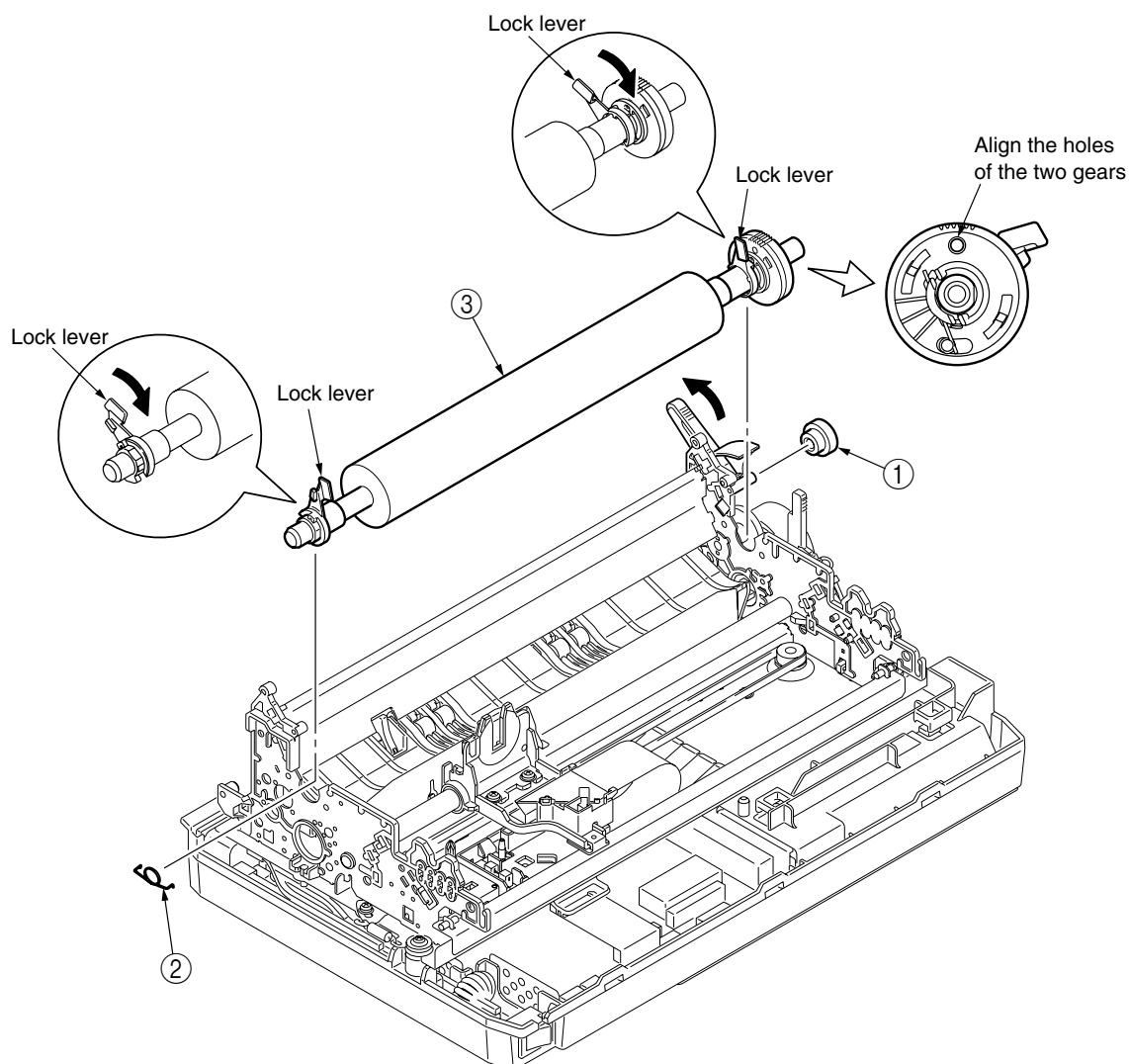


### 3.3.5 Platen Assy

- (1) Remove the ribbon protector.(See 3.3.1).
- (2) Remove the printhead. (See 3.3.2).
- (3) Remove the sheet guide Assy.(See 3.3.4).
- (4) Remove the tractor Assy.(See 3.3.4).
- (5) Remove the pull-up roller Assy.(See 3.3.4).
- (6) Remove the upper cover.(See 3.3.4).
- (7) Turn the change lever to the rear position
- (8) Open the claw and remove the pull-up gear①.
- (9) Remove the ground spring②.
- (10) Push in the lock levers on both sides to sides to unlock from the frame.
- (11) Remove the platen Assy③ from printer unite.
- (12) Assemble in the reverse order of disassembly.

#### Note:

- (1) Align the gears of the double gear on the right of the platen Assy., as shown in the illustration.

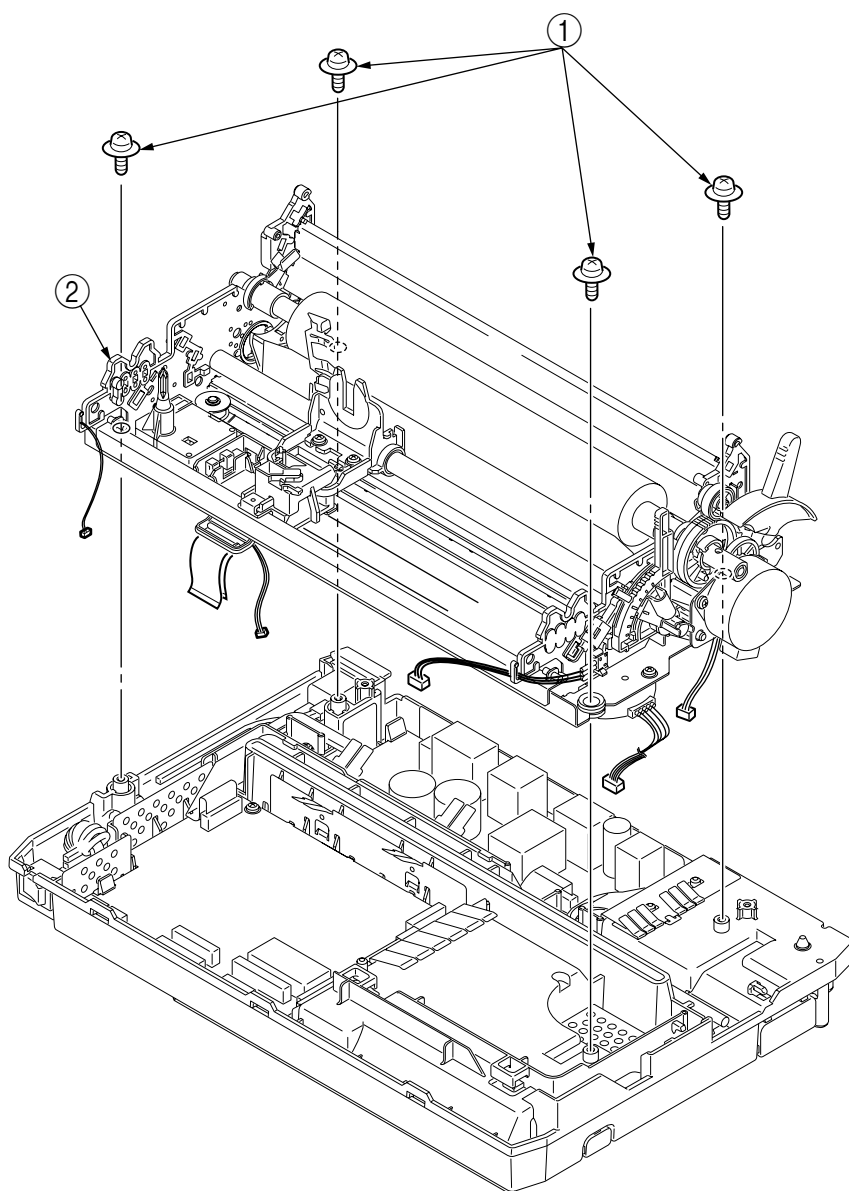


### 3.3.6 Printer unit

- (1) Remove the upper cover.(See. 3.3.4)
- (2) Disconnect the two head cables, homing sensor cable, SP motor cable, LF motor cable, gap sensor cable, and PE sensor cable from the connectors.
- (3) Remove the four mechanical locking screws ①.
- (4) Lift up and remove the printer unit ②.
- (5) Assemble in the reverse order of disassembly.

#### Notes :

- (1) Take care not to fold the carriage cable during installation. Curve slightly the carriage cable when assembling into the fastener.
- (2) Make sure that there is not any dust or oil on the connector contact sections A. If it is found, wipe it off by alcohol.

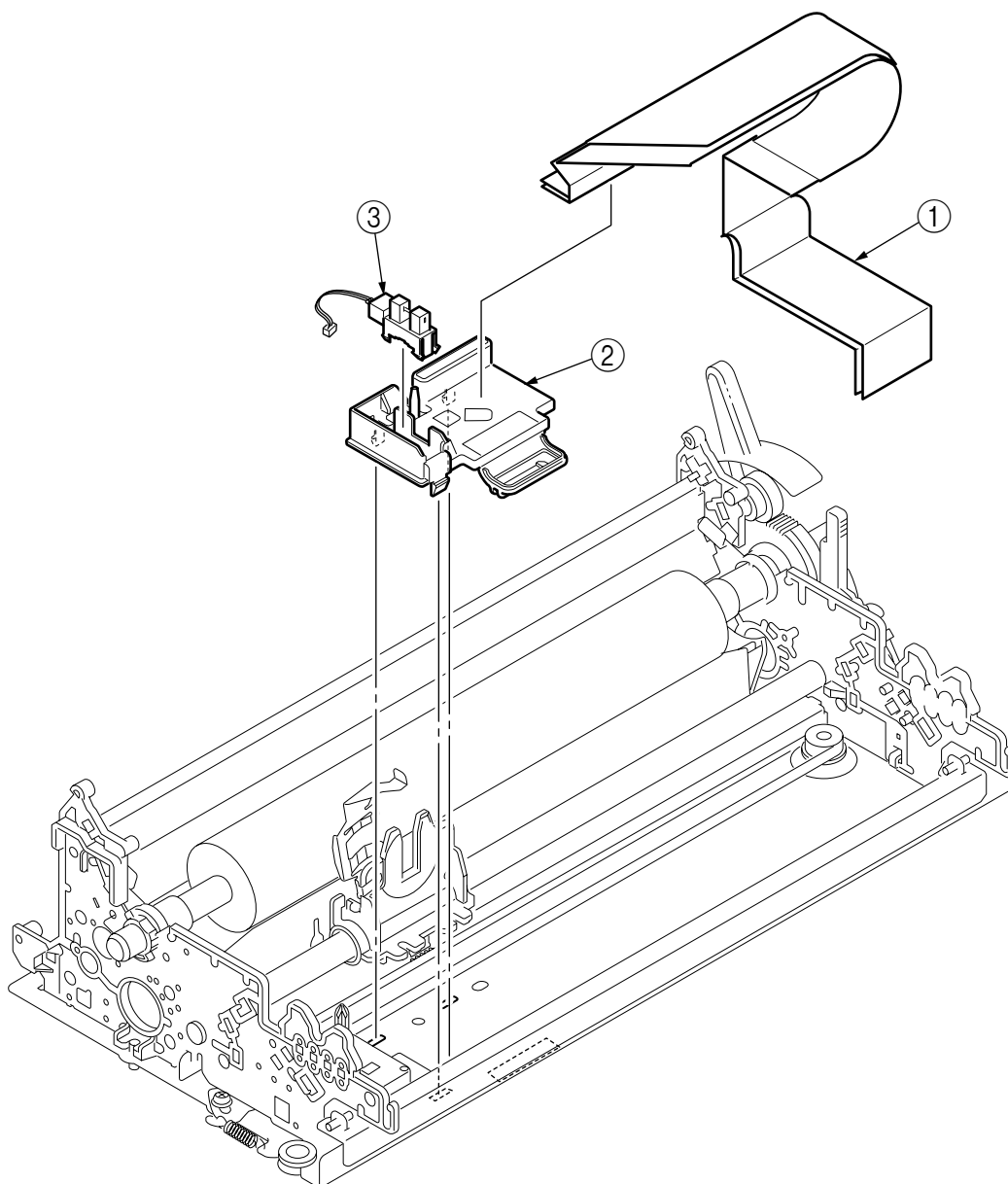


### 3.3.7 Carriage Cable, Homing sensor

- (1) Remove the ribbon protector.(See 3.3.1)
- (2) Remove the head.(See 3.3.2)
- (3) Remove the upper cover.(See 3.3.4)
- (4) Remove the printer unit.(See 3.3.6)
- (5) Open the three claws at the bottom and remove the head cable clamp.
- (6) Remove two carriage cables ① from the head cable clamp ②.
- (7) Remove the homing sensor ③ (photo interrupter) from the head cable clamp ②.
- (8) Assemble in the reverse order of disassembly.

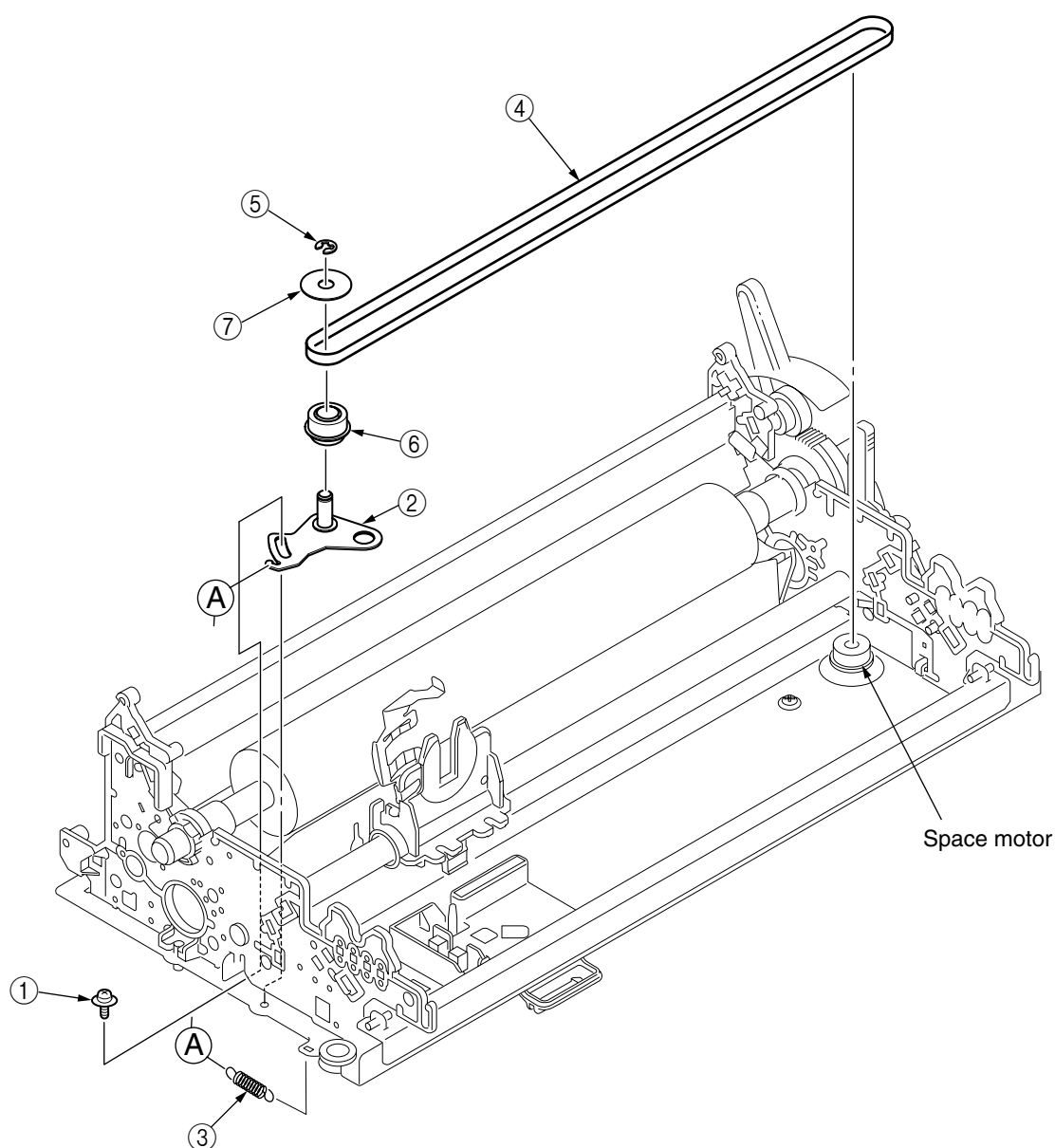
#### Notes :

- (1) Take care not to fold the head cable ① during installation. Curve slightly the head cable ① when assembling into the fasteners.
- (2) Make sure that there is not any dust or oil on the connector contact sections A to D. If it is found, wipe it off by alcohol.



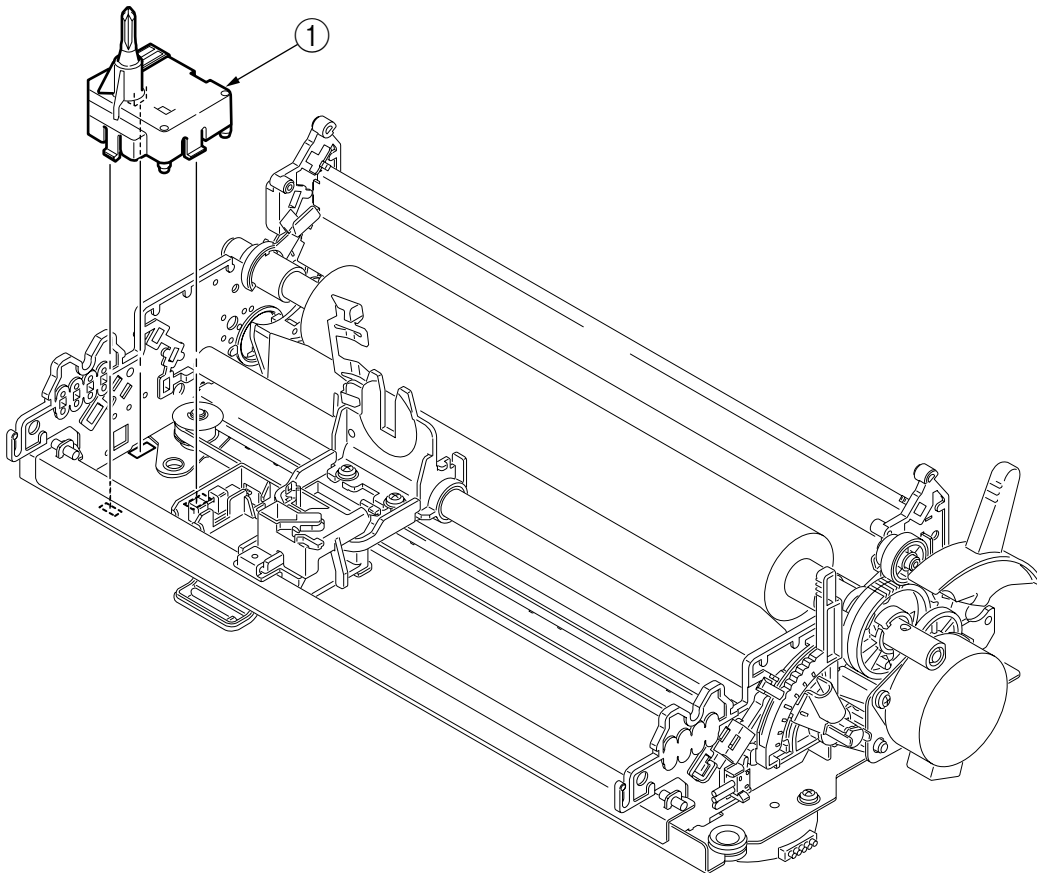
### 3.3.8 Idle-pulley

- (1) Remove the upper cover.(See 3.3.4)
- (2) Remove the printer unit.(See 3.3.6)
- (3) Remove the locking screw ① of the idle pulley bracket ②.
- (4) Remove the plate tension spring ③.
- (5) Remove the pitch belt ④ from the pulley on the space motor side.
- (6) Remove the E-ring ⑤ and remove the idle pulley ⑥ and washer ⑦.
- (7) Assemble in the reverse order of disassembly.



### 3.3.9 Ribbon Feed Assy.

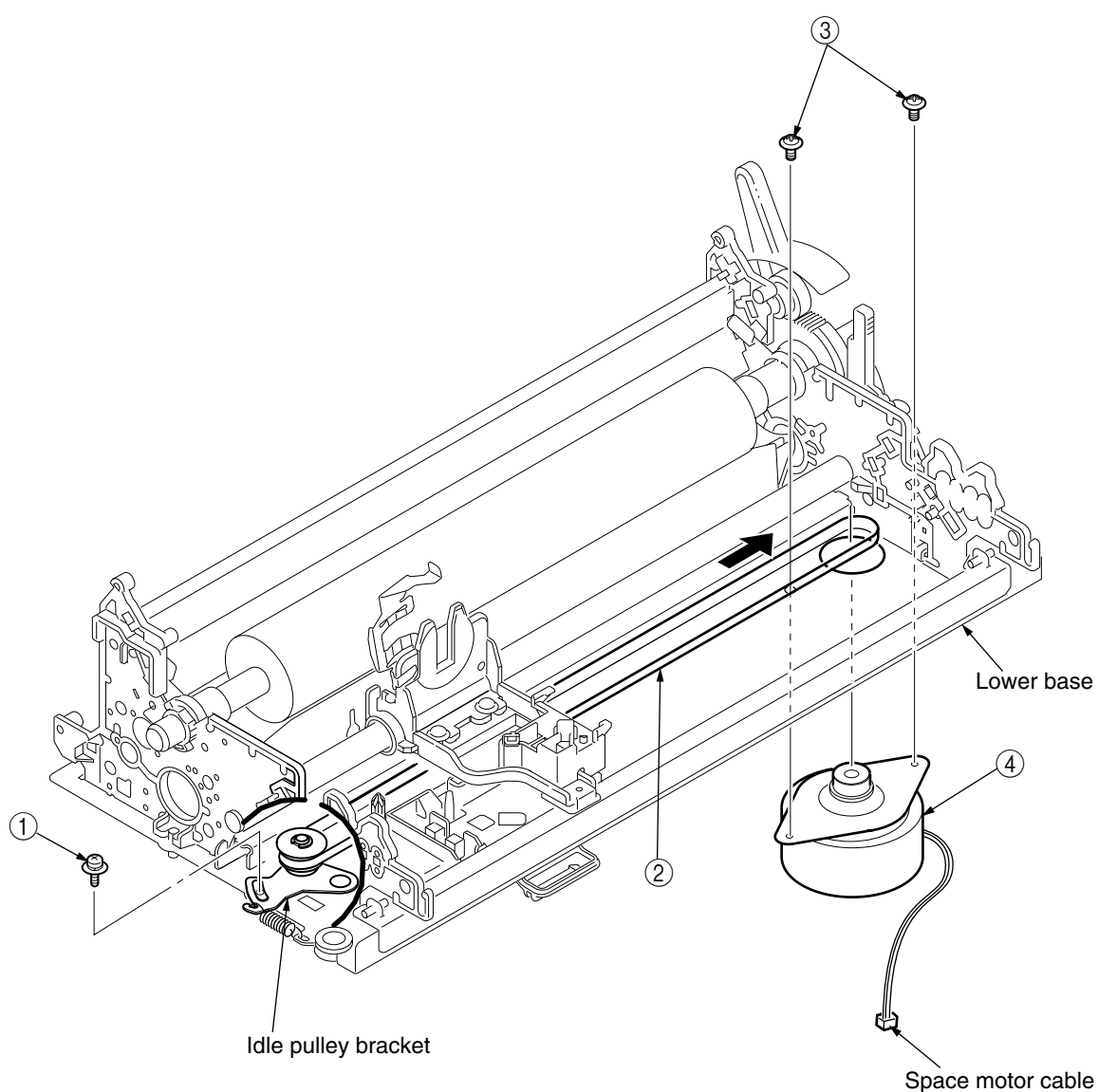
- (1) Remove the upper cover.(See 3.3.4)
- (2) Remove the printer unit.(See 3.3.6)
- (3) Remove the idle pulley.(See 3.3.8)
- (4) Disengage the three claws and remove the ribbon feed Assy ①.
- (5) Assemble in the reverse order of disassembly.





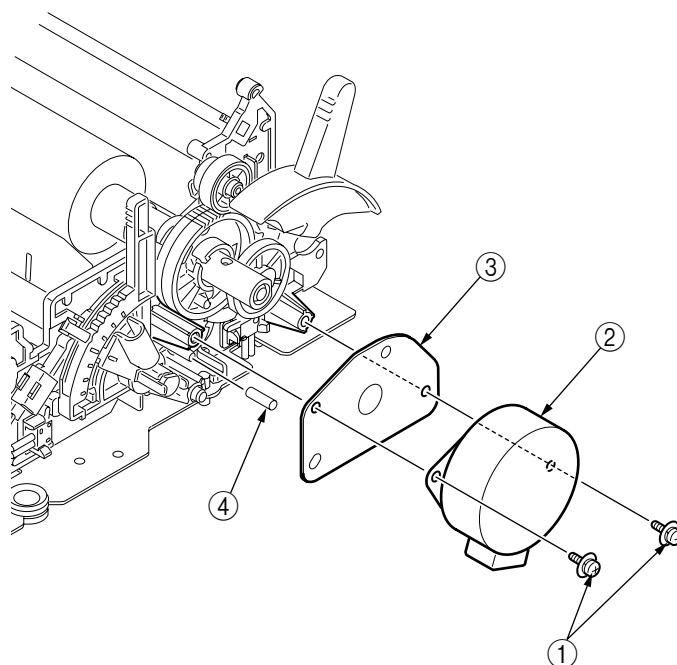
### 3.3.10 Stepping Motor (Space)

- (1) Remove the upper cover.
- (2) Remove the printer unit.
- (3) Disconnect the space motor cable from the connector on the control board.
- (4) Remove the locking screw ① of the idle pulley bracket.
- (5) Push the mini pitch belt in the direction of the arrow and remove the mini pitch belt ② from the space motor pulley.
- (6) Remove the two screws ③ locking the space motor ④ in place and remove the space motor ④ from the lower base.
- (7) Assemble in the reverse order of disassembly.



### 3.3.11 LF Motor

- (1) Remove the upper cover.(See. 3.3.4)
- (2) Remove the printer unit.(See. 3.3.6)
- (3) Remove the two screws ① locking the LF motor in place ③ and remove the LF motor ②. The LF motor plate ③ and earth\_spring\_LF ④ will come off with the motor.
- (4) Assemble in the reverse order of disassembly.

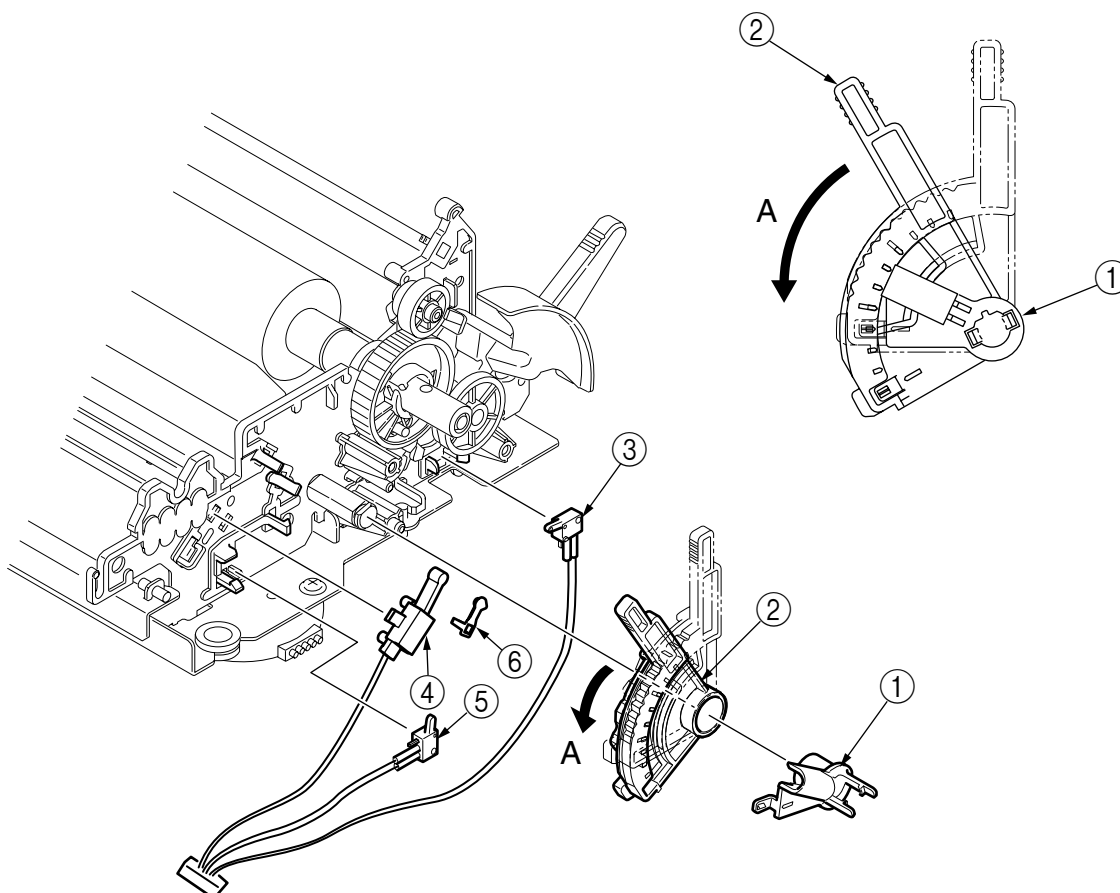


### 3.3.12 Gap Sensor Cable, Gap SW and continuous-form/cut-sheet SW

- (1) Remove the upper cover.(See. 3.3.4)
- (2) Remove the printer unit.(See. 3.3.6)
- (3) Remove the LF motor.(See. 3.3.11)
- (4) Turn the adjustment knob ① in the direction of arrow A, detach the two claws, and remove the adjustment lever (HG) ②.
- (5) Open the three claws of the side frame and remove the adjustment lever ②.
- (6) Open the claw on the side frame and remove the continuous-form/cut-sheet SW ③.
- (7) Open the claw on the side frame and remove the range 1 SW ④.
- (8) Open the claw on the side frame and remove the gap SW ⑤.
- (9) Remove the piece-sensor ⑥.
- (10) Assemble in the reverse order of disassembly.

#### Notes :

- (1) Be careful not to damage the range 1 SW ④ lever when attaching the adjustment lever ②.
- (2) After installation, check and adjust the gap between platen and printhead.

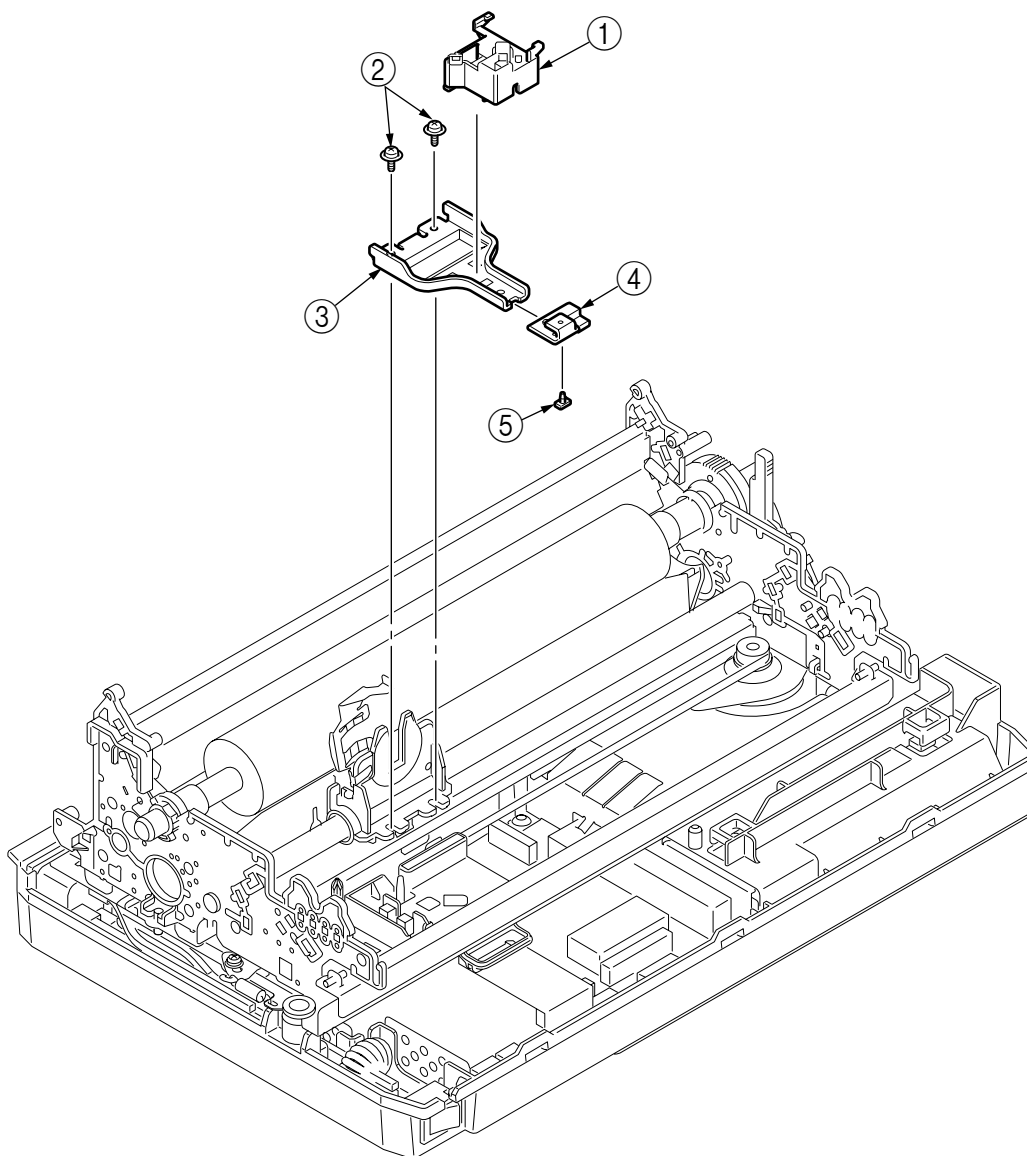


### 3.3.13 Slider Piece-Slider

- (1) Remove the ribbon protector.(See 3.3.1).
- (2) Remove the printhead.(See 3.3.2).
- (3) Remove the upper cover.(See 3.3.4).
- (4) Remove the cable guide ①.
- (5) Remove the two screws ② and remove the carriage plate ③.
- (6) Remove the slider ④ and the slider piece⑤ from the carriage plate.
- (7) Assemble in the reverse order of disassembly.

#### Notes :

- (1) Pressing the carriage plate ③ against the carriage frame, fasten the carriage plate with the screws ②.
- (2) After installation, check and adjust the gap between platen and printhead (see 4-1).

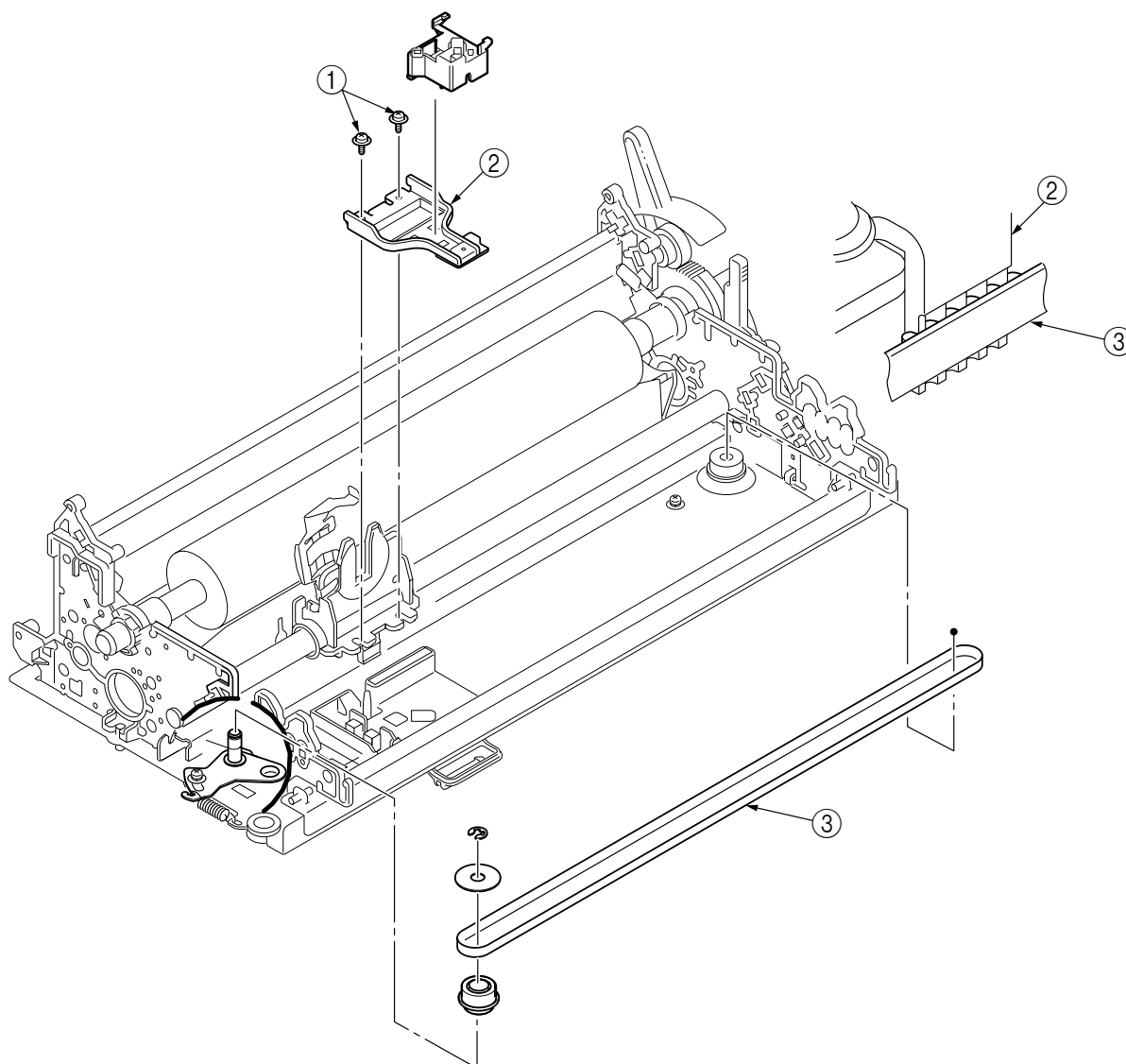


### 3.3.14 Mini Pitch Belt

- (1) Remove the printhead.(See. 3.3.2)
- (2) Remove the upper cover.(See. 3.3.4)
- (3) Remove the printer unit.(See. 3.3.6)
- (4) Remove the idle pulley bracket.(See. 3.3.8)
- (5) Remove the two screws ① and remove the carriage plate ②.
- (6) Remove the mini pitch belt ③.
- (7) Assemble in the reverse order of disassembly.

#### Note:

- (1) When fastening the belt with the carriage plate ②, make sure that the teeth are engaged with each other and that the belt ③ is not bent as shown in the illustrations below.

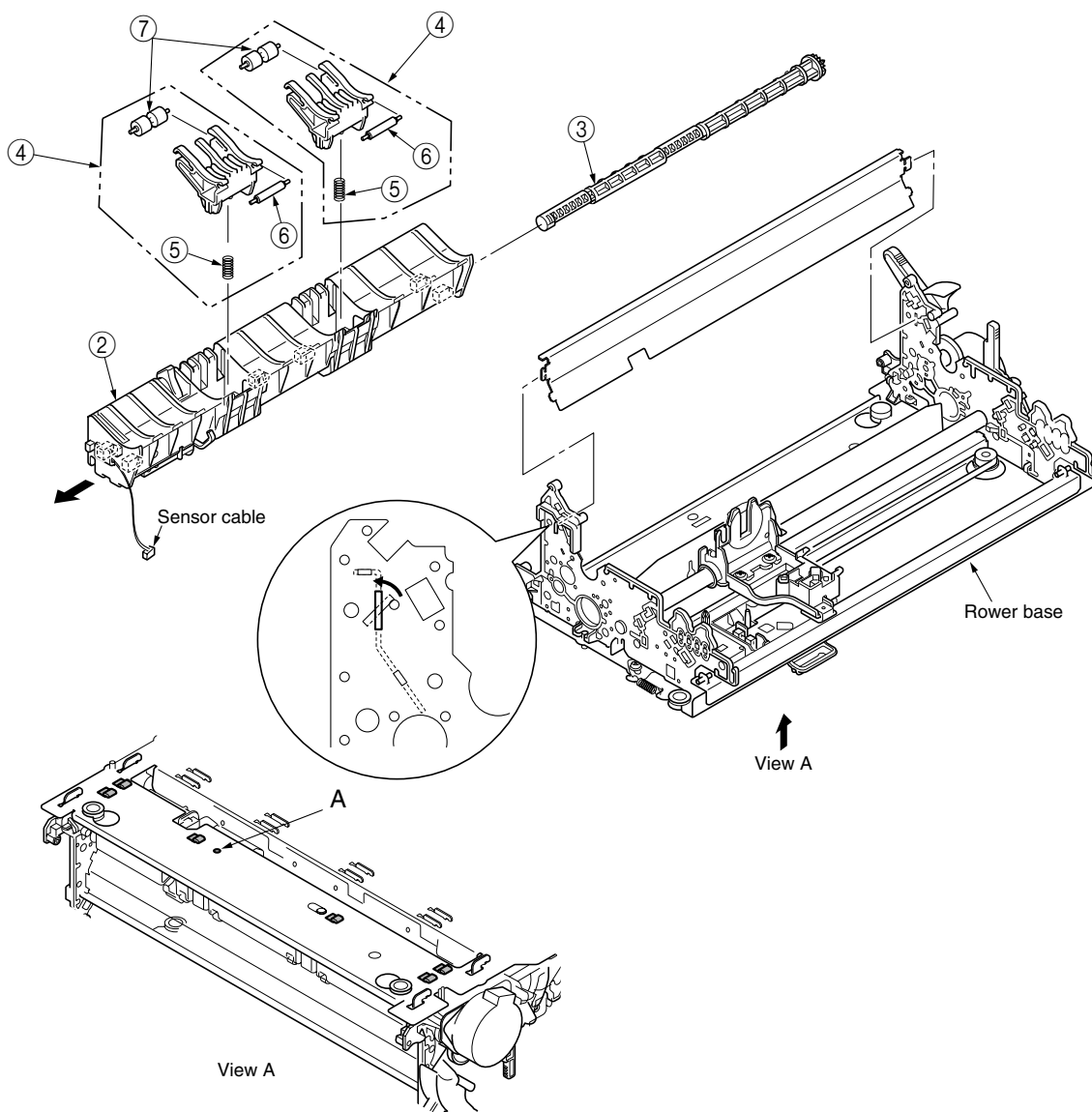


### 3.3.15 Paper Pan Assy, Roller Assy

- (1) Remove the upper cover.(See. 3.3.4)
- (2) Remove the printer unit.(See. 3.3.6)
- (3) Remove the platen.(See. 3.3.5)
- (4) Remove the sensor cable from the claw on the side frame.
- (5) Turn the right and left claws on the rear beam ① in the direction of the arrow, and remove from the side frame.
- (6) While pressing area A as shown below, slide the paper pan Assy. in the direction of the arrow. Release the six claws of the paper pan Assy ②. from the lower base and remove the Assy.
- (7) Align the protrusion of the release shaft ③ with the groove in the paper pan ② and, while pushing down both ends of the roller Assy ④, draw out the release shaft ③.
- (8) Remove the release spring ⑤, front roller ⑥, and rear roller ⑦ from the roller Assy ④.
- (9) To perform mounting, follow the reverse procedure of removal.

Note:

- (1) Align the portion of the release shaft indicated by the arrow with the V-groove in the release lever to assemble them.

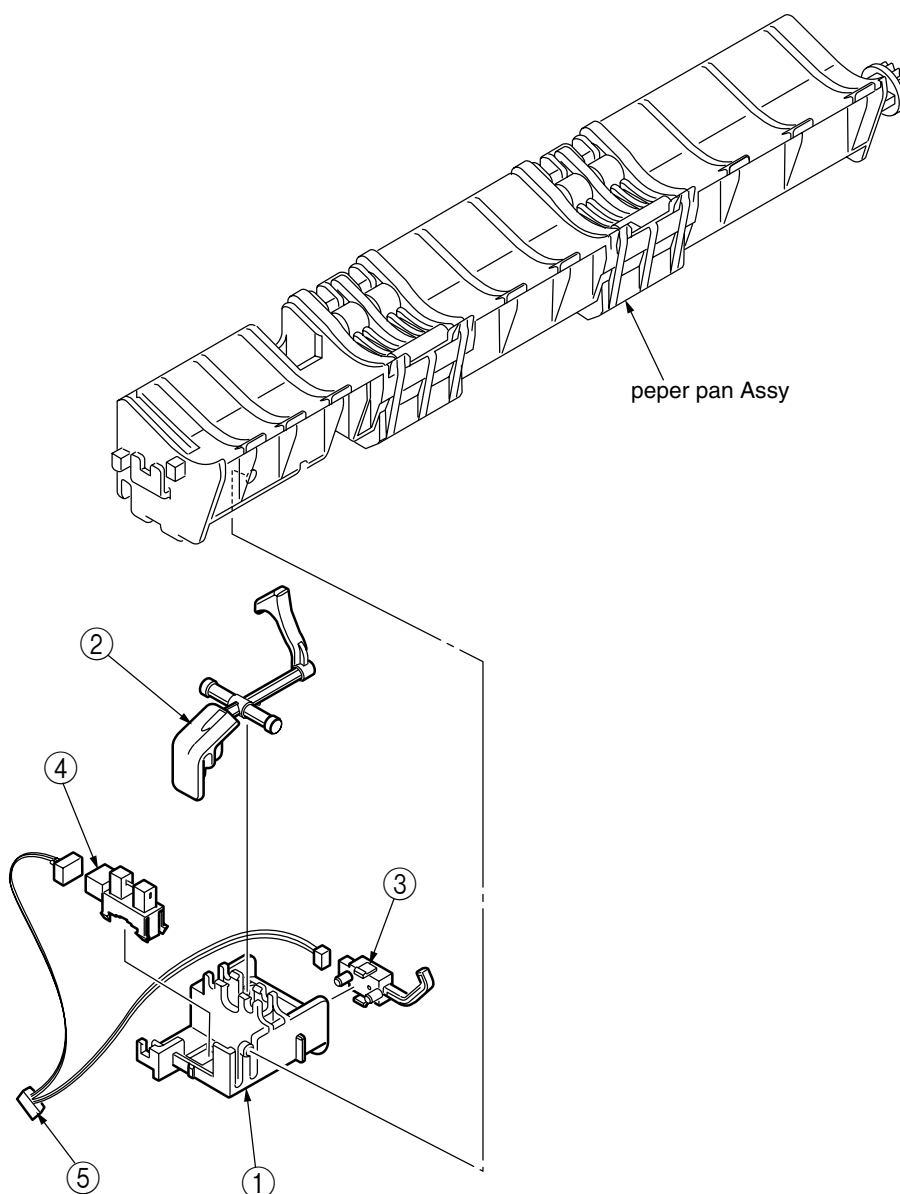


### 3.3.16 Bottom sensor, photo interrupter and sensor cord (6P)

- (1) Remove the upper cover.(See. 3.3.4)
- (2) Remove the printer unit.(See. 3.3.6)
- (3) Remove the platen.(See. 3.3.5)
- (4) Remove the paper pan Assy.(See. 3.3.15)
- (5) Release the two claws of the sensor arm holder Assy. ② and remove the paper pan Assy.
- (6) Remove the sensor arm ②.
- (7) Open the two claws and remove the bottom sensor ③.
- (8) Remove the photo interrupter ④.
- (9) Remove the sensor cable (1P) ⑤ from the bottom sensor ③ and photo interrupter ④.
- (10) To perform mounting, follow the reverse procedure of removal.

#### Remake on Assembly

- (1) After assembling, make sure that the sensor arm moves smoothly.

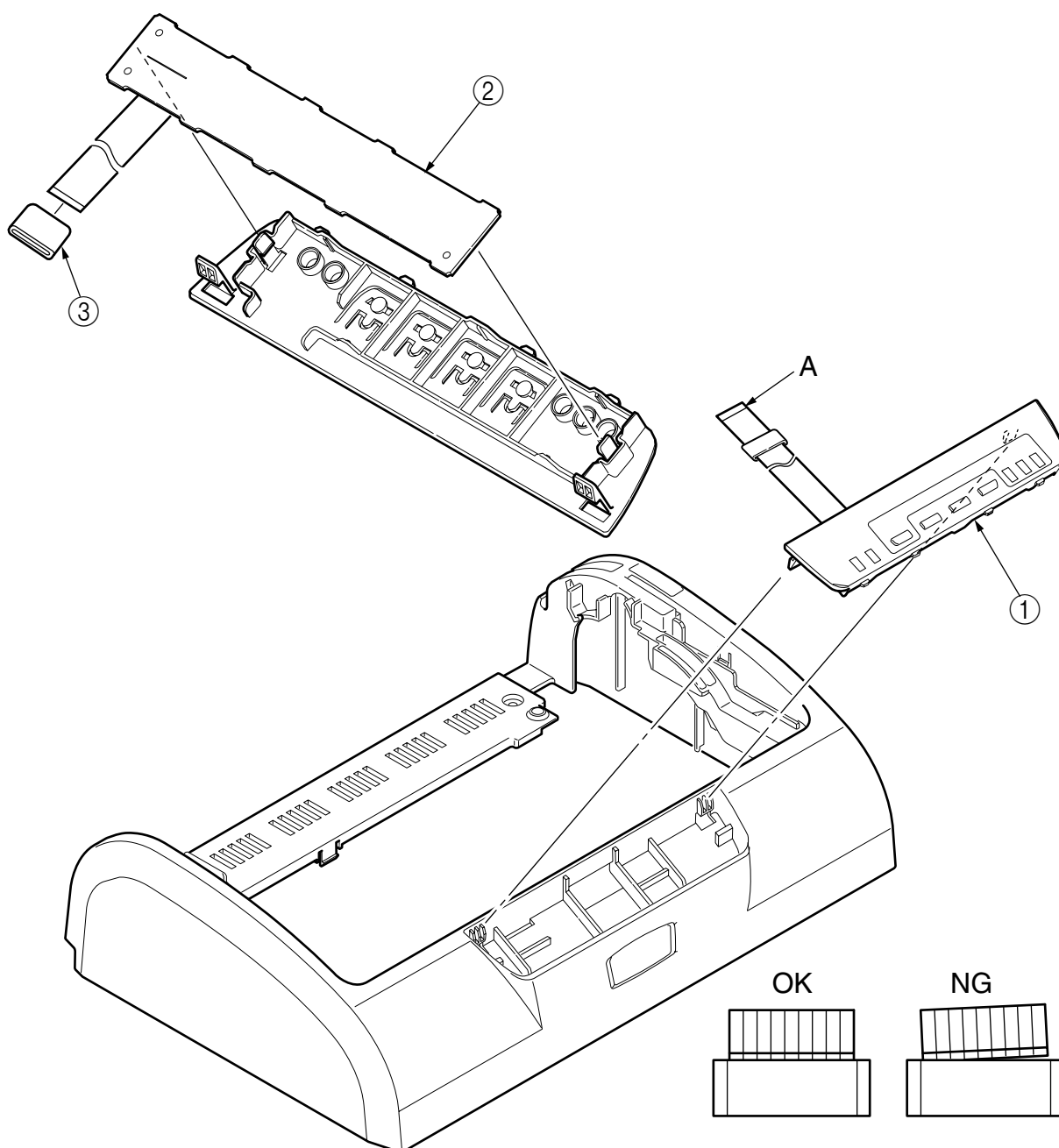


### 3.3.17 Operation Panel Board and Operation Panel cord

- (1) Remove the upper cover.(See. 3.3.4)
- (2) Release the two claws and remove the operation panel frame Assy ①.
- (3) Release the two claws of the operation panel frame ①, remove the board LSO ② and core ③.
- (4) Assemble in the reverse order of disassembly.

#### Remark on assembly:

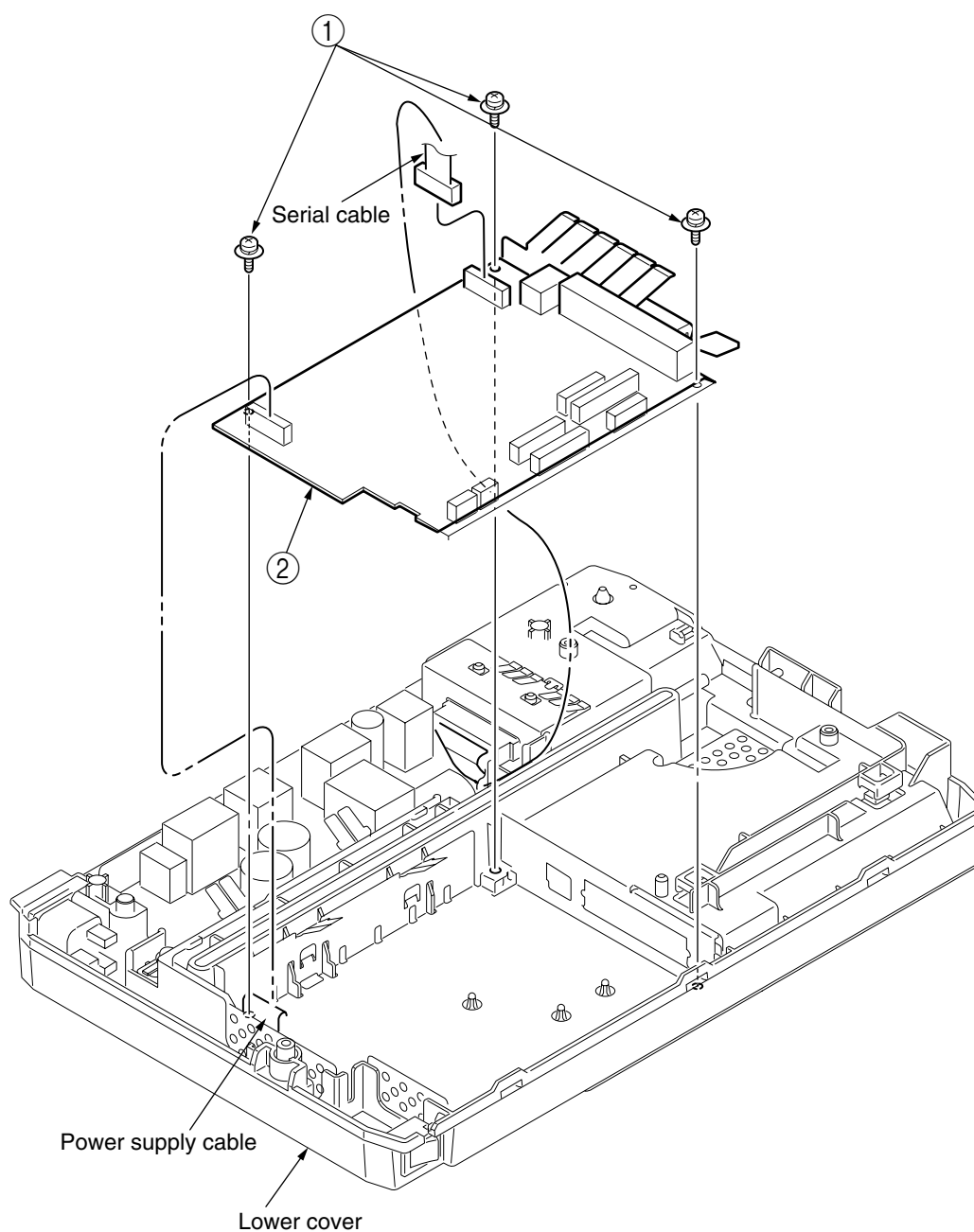
- (1) Make sure that there is not any dust or oil on the connector contact section A. If it is found, wipe it off by alcohol.
- (2) When connecting the cable to the connector, make sure that they are securely locked, and not joined askew.



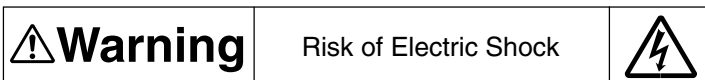


### 3.3.18 Control Board Assy.

- (1) Remove the upper cover.(See. 3.3.4)
- (2) Remove the printer unit.(See. 3.3.6)
- (3) Disconnect the serial cable from the connector on the control board.
- (4) Disconnect the power supply cable from the connector.
- (5) Remove the three screws ①.
- (6) Open one claw on the lower cover and remove the control board ②.
- (7) Assemble in the reverse order of disassembly.



## 3.3.19.1 Power supply Assy (for OEL/TAIWAN/THAI: Rev. ~B0, AOS: Rev. C0)



There is a risk of electric shock during replacement of the power supply.

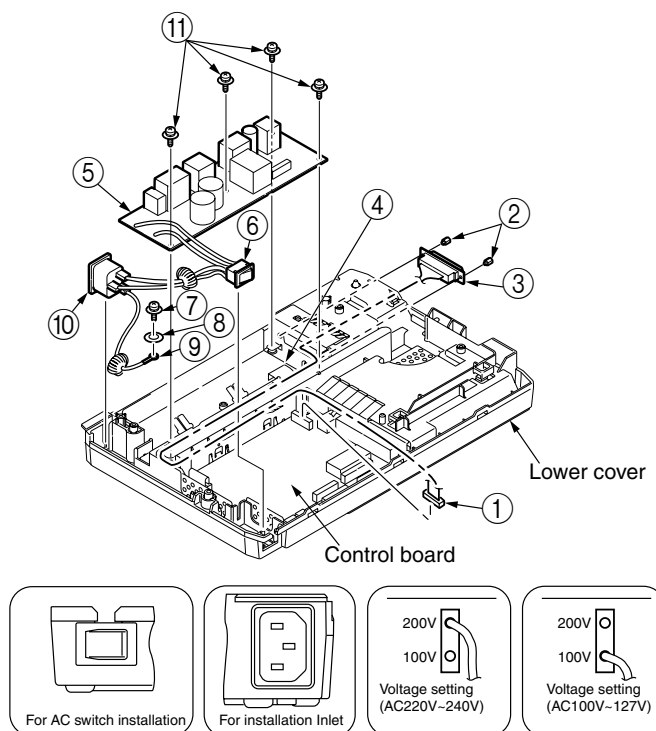
Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cable is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

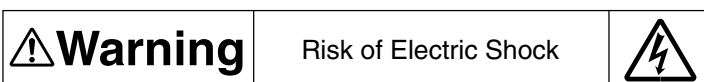
- (1) Remove the upper cover.(See. 3.3.4)
- (2) Remove the printer unit.(See. 3.3.6)
- (3) Disconnect the serial cable ① from the control board.
- (4) Remove the two screws ② of the connector ③ and disconnect the connector ③.
- (5) Disconnect the power supply cable from the control board and remove the cable from the lower cover. Disconnect the power supply cable ④ from the power supply ⑤.
- (6) Remove the AC switch ⑥ from the lower cover.
- (7) Remove the screw ⑦ and washer ⑧ of the ground wire ⑨ and remove the inlet ⑩ from the lower cover.
- (8) Remove the four screws ⑪, open the claw on the lower cover, and remove the power supply.
- (9) Assemble in the reverse order of disassembly.

## Notes :

- (1) Make sure that the AC switch is installed in the direction shown in the illustration.
- (2) Make sure that the inlet is installed in the direction shown in the illustration.
- (3) Follow user's specification, and set the voltage setting pin as shown in the illustration.



## 3.3.19.2 Power supply Assy (for OEL/TAIWAN/THAI: Rev. D0~, AOS: Rev. E0~)



There is a risk of electric shock during replacement of the power supply.

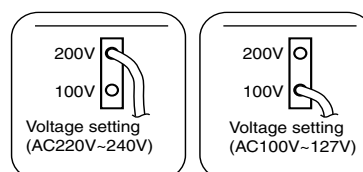
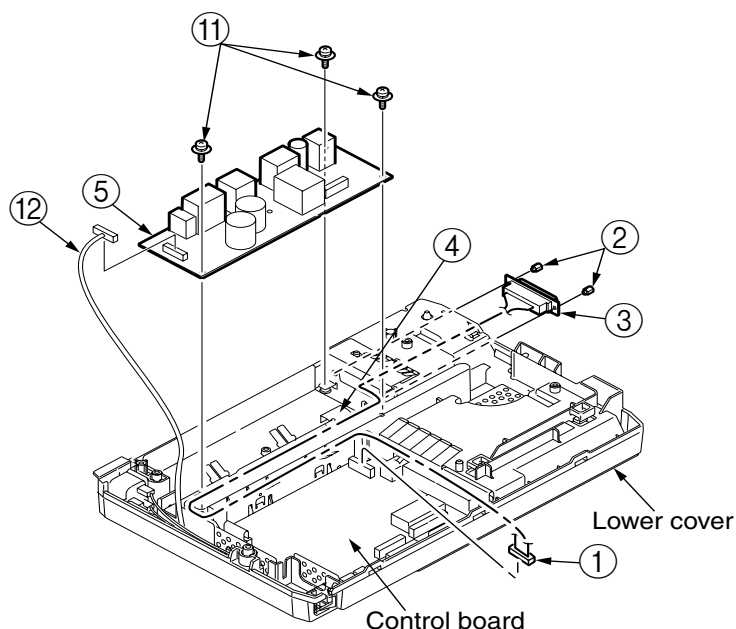
Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cable is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

- (1) Remove the upper cover.(See. 3.3.4)
- (2) Remove the printer unit.(See. 3.3.6)
- (3) Disconnect the serial cable ① from the control board.
- (4) Remove the two screws ② of the connector ③ and disconnect the connector ③.
- (5) Disconnect the power supply cable ④ from the power supply ⑤.
- (6) Disconnect the power supply cable ⑫ from the power supply ⑤.
- (7) Remove the three screws ⑪, open the claw on the lower cover, and remove the power supply.
- (8) Assemble in the reverse order of disassembly.

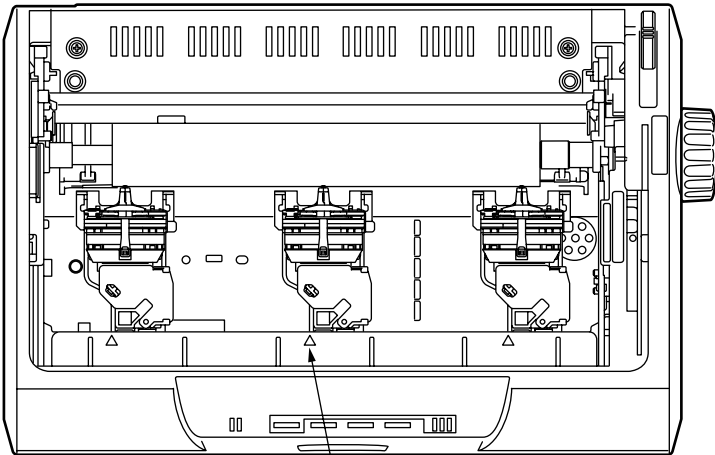
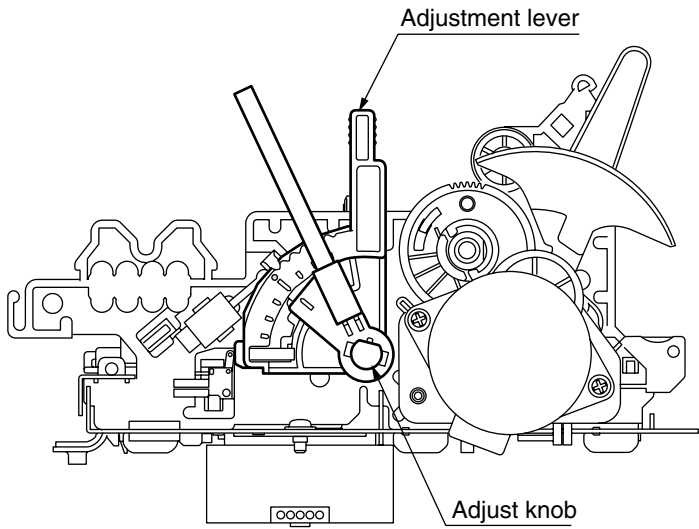
Notes :

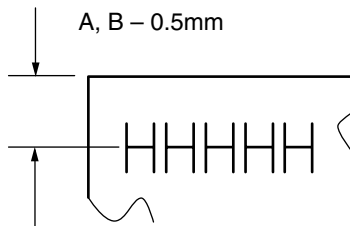
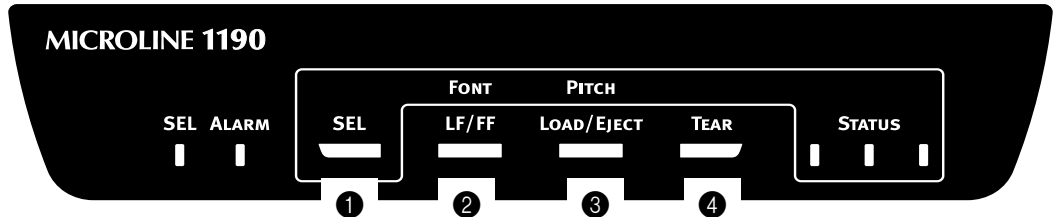
- (1) Follow user's specification, and set the voltage setting pin as shown in the illustration.



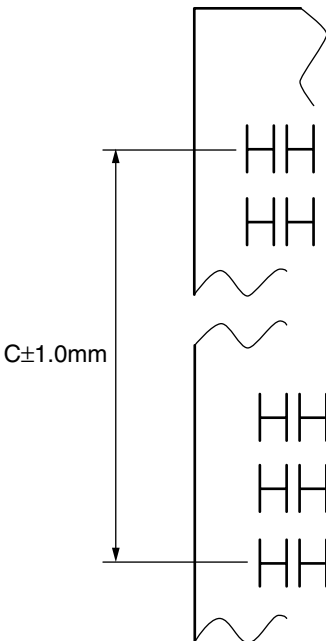
## 4. ADJUSTMENT

- (1) Be sure to carry out this adjustment with the printer mechanism mounted on the lower cover.
- (2) Be sure to carry out this adjustment operation on a level and highly rigid work table (flatness: less than 0.039 inch or 1 mm) so as to minimize adjustment error.
- (3) Perform this adjustment at normal room temperature ( $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ) and humidity.
- (4) Preparations
  - Turn off the AC switch and disconnect the power cable.
  - Remove the pull-up unit.
  - Remove the tractor assy.
  - Remove the sheet guide assy.
  - Remove the upper cover.

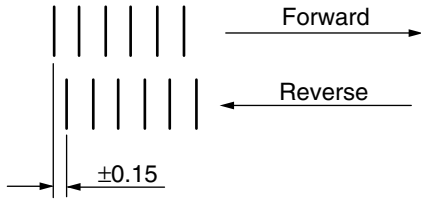
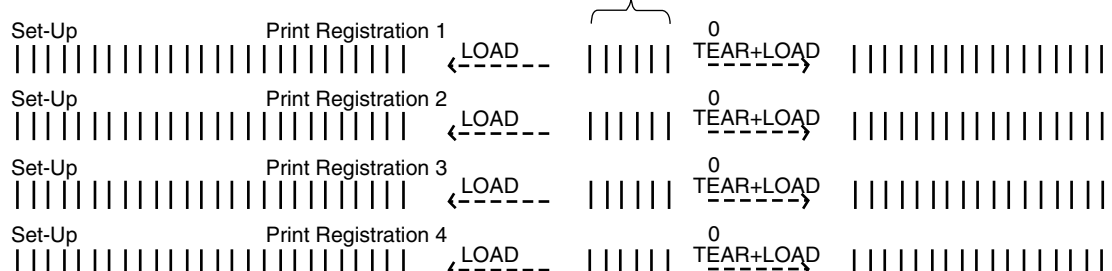
No.	Item	Specification	Drawing	Adjustment method
4.1	Gap between platen and print head		 <p>Make sure that the left edge of the carriage plate aligns with the “△” symbol on the upper cover when it is positioned on the right or left side or in the center.</p>	<p>&lt;&lt;Checking&gt;&gt; Check the platen in three places: right and left ends and center.</p> <p>&lt;&lt;Adjustment procedure&gt;&gt;</p> <ol style="list-style-type: none"> <li>(1) If the right and left platen gaps differ, rotate the adjust knob on the right side of the printer forward or backward to adjust for the difference.</li> <li>(2) Turn the adjustment lever into the range 1.</li> <li>(3) Rotate the adjustment lever and the adjust knob forward or backward to adjust the right, left, and center gaps to the specified value.</li> </ol>
	Initial adjustment	0.41±0.03 mm		

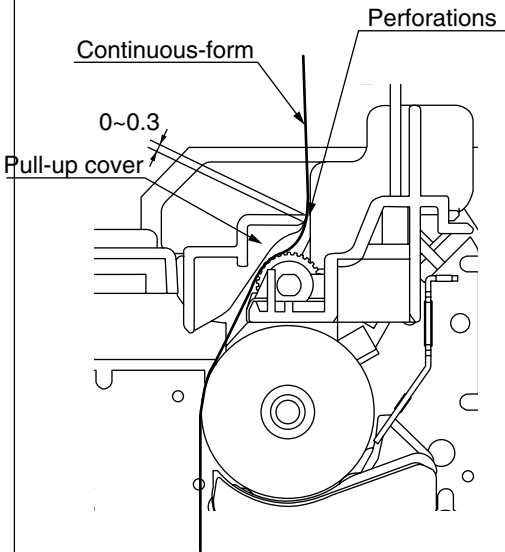
No.	Item	Specification	Drawing	Adjustment method						
4.2	Paper top positioning distance check	Preset ± 0.5 mm	<div><p>A, B – 0.5mm</p><table><tr><th></th><th>Top position</th></tr><tr><td>Cut sheet (manual feed)</td><td>A±0.5mm</td></tr><tr><td>Continuous form (rear)</td><td>B±0.5mm</td></tr></table></div>		Top position	Cut sheet (manual feed)	A±0.5mm	Continuous form (rear)	B±0.5mm	<div><p>(1) Set 1P-55 kg paper.</p><p>1.Set cut-sheet paper (manual feed) in the sheet guide.</p><p>2.Set continuous-form roll paper on the rear tractor or bottom tractor.</p><p>(2) Print the test data from the PC dedicated to testing.</p><p>(3) Check to confirm that the top positioning distance is within the specified range.</p></div>
	Top position									
Cut sheet (manual feed)	A±0.5mm									
Continuous form (rear)	B±0.5mm									
<div></div> <div><p>ex) ML 1190 operation panel is shown.</p></div> <div><p>(4) If this lies outside the specified range, correct as described below.</p></div>										

No.	Item	Specification	Drawing	Adjustment method																																																																																																																												
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(When ❹SW and ❸SW are pressed simultaneously, the position will move -0.14mm.)</p> <p>(6) After making the corrections and while holding down ❹SW, press ❸SW and ❷SW simultaneously to register the correction value into printer memory.</p>
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4.3	Correcting cut-sheet 40-line feed height	$C \pm 0.5 \text{ mm}$	<div></div> <div><table><tr><th>Preset</th><th>Correction</th></tr><tr><td>+14</td><td>Move 1.48 mm forward from the reference position.</td></tr><tr><td>+13</td><td>Move 1.34 mm forward from the reference position.</td></tr><tr><td>+12</td><td>Move 1.27 mm forward from the reference position.</td></tr><tr><td>+11</td><td>Move 1.13 mm forward from the reference position.</td></tr><tr><td>+10</td><td>Move 1.06 mm forward from the reference position.</td></tr><tr><td>+9</td><td>Move 0.92 mm forward from the reference position.</td></tr><tr><td>+8</td><td>Move 0.85 mm forward from the reference position.</td></tr><tr><td>+7</td><td>Move 0.71 mm forward from the reference position.</td></tr><tr><td>+6</td><td>Move 0.64 mm forward from the reference position.</td></tr><tr><td>+5</td><td>Move 0.49 mm forward from the reference position.</td></tr><tr><td>+4</td><td>Move 0.42 mm forward from the reference position.</td></tr><tr><td>+3</td><td>Move 0.28 mm forward from the reference position.</td></tr><tr><td>+2</td><td>Move 0.21 mm forward from the reference position.</td></tr><tr><td>+1</td><td>Move 0.07 mm forward from the reference position.</td></tr><tr><td>0</td><td>Reference position</td></tr><tr><td>-1</td><td>Move 0.07 mm back from the reference position.</td></tr><tr><td>-2</td><td>Move 0.21 mm back from the reference position.</td></tr><tr><td>-3</td><td>Move 0.28 mm back from the reference position.</td></tr><tr><td>-4</td><td>Move 0.42 mm back from the reference position.</td></tr><tr><td>-5</td><td>Move 0.49 mm back from the reference position.</td></tr><tr><td>-6</td><td>Move 0.64 mm back from the reference position.</td></tr><tr><td>-7</td><td>Move 0.71 mm back from the reference position.</td></tr><tr><td>-8</td><td>Move 0.85 mm back from the reference position.</td></tr><tr><td>-9</td><td>Move 0.92 mm back from the reference position.</td></tr><tr><td>-10</td><td>Move 1.06 mm back from the reference position.</td></tr><tr><td>-11</td><td>Move 1.13 mm back from the reference position.</td></tr><tr><td>-12</td><td>Move 1.27 mm back from the reference position.</td></tr><tr><td>-13</td><td>Move 1.34 mm back from the reference position.</td></tr><tr><td>-14</td><td>Move 1.48 mm back from the reference position.</td></tr></table></div>	Preset	Correction	+14	Move 1.48 mm forward from the reference position.	+13	Move 1.34 mm forward from the reference position.	+12	Move 1.27 mm forward from the reference position.	+11	Move 1.13 mm forward from the reference position.	+10	Move 1.06 mm forward from the reference position.	+9	Move 0.92 mm forward from the reference position.	+8	Move 0.85 mm forward from the reference position.	+7	Move 0.71 mm forward from the reference position.	+6	Move 0.64 mm forward from the reference position.	+5	Move 0.49 mm forward from the reference position.	+4	Move 0.42 mm forward from the reference position.	+3	Move 0.28 mm forward from the reference position.	+2	Move 0.21 mm forward from the reference position.	+1	Move 0.07 mm forward from the reference position.	0	Reference position	-1	Move 0.07 mm back from the reference position.	-2	Move 0.21 mm back from the reference position.	-3	Move 0.28 mm back from the reference position.	-4	Move 0.42 mm back from the reference position.	-5	Move 0.49 mm back from the reference position.	-6	Move 0.64 mm back from the reference position.	-7	Move 0.71 mm back from the reference position.	-8	Move 0.85 mm back from the reference position.	-9	Move 0.92 mm back from the reference position.	-10	Move 1.06 mm back from the reference position.	-11	Move 1.13 mm back from the reference position.	-12	Move 1.27 mm back from the reference position.	-13	Move 1.34 mm back from the reference position.	-14	Move 1.48 mm back from the reference position.	<div><div><div><div>(1) Set cut-sheet (manual feed) A4-55 kg paper in the sheet guide.</div><div>(2) Print the test data from the PC dedicated to testing.</div><div>(3) Check to confirm that the 40-line feed height is within the specified range.</div><div>(4) If this lies outside the specified range, correct as described below.</div></div></div><div><div><div><div>(1) Turn on power while holding down ❶SW.</div><div>(2) You will enter menu mode.</div><div>(3) Select a group while holding down ❶SW.</div><div>(4) Select an item while holding down ❷SW.</div><div>(5) Press ❸SW to move the printing position 1 pitch from the reference position. (When ❹SW and ❸SW are pressed simultaneously, the position will move -1 pitch.)</div><div>(6) After making the correction and while holding down ❹SW, press ❸SW and ❷SW simultaneously to register the correction value in printer memory.</div></div></div></div></div>
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No.	Item	Specification	Drawing	Adjustment method																																												
4.4	Correcting both-direction print registration	Within ± 0.1 mm	<div></div> <p>Correct print registration in the forward direction if the output is reversed.</p> <p>Check the registration both on a cut sheet and a continuous form.</p>	<div><p>(1) Set paper with 55 kg ream weight.</p><p>(2) Turn on power while holding down ❶SW.</p><p>(3) Press ❷SW and print the menu pattern.</p><p>Check to confirm that the horizontal registration error is within the specified range.</p><p>If this lies outside the specified range;</p><p>(1) Turn on power while holding down ❶SW.</p><p>(2) You will enter menu mode.</p><p>(3) Select a group while holding down ❶SW.</p><p>(4) Select an item while holding down ❷SW.</p><p>(5) Pressing ❸SW will move the printing position +0.035 mm from the reference position.</p><p>(Pressing ❸SW and ❹SW simultaneously will shift the position -0.035 mm.)</p><p>(6) After making the corrections and while holding down ❹SW, press ❸SW and ❷SW simultaneously to register the correction value into printer memory.</p></div>																																												
		<div><table><tr><th>Preset</th><th>Correction</th></tr><tr><td>+10</td><td>Move 0.35 mm to the right from the reference position.</td></tr><tr><td>+9</td><td>Move 0.32 mm to the right from the reference position.</td></tr><tr><td>+8</td><td>Move 0.28 mm to the right from the reference position.</td></tr><tr><td>+7</td><td>Move 0.25 mm to the right from the reference position.</td></tr><tr><td>+6</td><td>Move 0.21 mm to the right from the reference position.</td></tr><tr><td>+5</td><td>Move 0.18 mm to the right from the reference position.</td></tr><tr><td>+4</td><td>Move 0.14 mm to the right from the reference position.</td></tr><tr><td>+3</td><td>Move 0.11 mm to the right from the reference position.</td></tr><tr><td>+2</td><td>Move 0.07 mm to the right from the reference position.</td></tr><tr><td>+1</td><td>Move 0.04 mm to the right from the reference position.</td></tr><tr><td>0</td><td>Reference position</td></tr><tr><td>-1</td><td>Move 0.04 mm to the left from the reference position.</td></tr><tr><td>-2</td><td>Move 0.07 mm to the left from the reference position.</td></tr><tr><td>-3</td><td>Move 0.11 mm to the left from the reference position.</td></tr><tr><td>-4</td><td>Move 0.14 mm to the left from the reference position.</td></tr><tr><td>-5</td><td>Move 0.18 mm to the left from the reference position.</td></tr><tr><td>-6</td><td>Move 0.21 mm to the left from the reference position.</td></tr><tr><td>-7</td><td>Move 0.25 mm to the left from the reference position.</td></tr><tr><td>-8</td><td>Move 0.28 mm to the left from the reference position.</td></tr><tr><td>-9</td><td>Move 0.32 mm to the left from the reference position.</td></tr><tr><td>-10</td><td>Move 0.35 mm to the left from the reference position.</td></tr></table></div>	Preset	Correction	+10	Move 0.35 mm to the right from the reference position.	+9	Move 0.32 mm to the right from the reference position.	+8	Move 0.28 mm to the right from the reference position.	+7	Move 0.25 mm to the right from the reference position.	+6	Move 0.21 mm to the right from the reference position.	+5	Move 0.18 mm to the right from the reference position.	+4	Move 0.14 mm to the right from the reference position.	+3	Move 0.11 mm to the right from the reference position.	+2	Move 0.07 mm to the right from the reference position.	+1	Move 0.04 mm to the right from the reference position.	0	Reference position	-1	Move 0.04 mm to the left from the reference position.	-2	Move 0.07 mm to the left from the reference position.	-3	Move 0.11 mm to the left from the reference position.	-4	Move 0.14 mm to the left from the reference position.	-5	Move 0.18 mm to the left from the reference position.	-6	Move 0.21 mm to the left from the reference position.	-7	Move 0.25 mm to the left from the reference position.	-8	Move 0.28 mm to the left from the reference position.	-9	Move 0.32 mm to the left from the reference position.	-10	Move 0.35 mm to the left from the reference position.		
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		ex) ML 1190 menu print pattern is shown.	<div><p>Check print registration here.</p></div>																																													

No.	Item	Specification	Drawing	Adjustment method
4.5	Paper cut position check	0~0.3 mm		<p>(1) Set a continuous-form roll (1P-55 kg, 10 inches) on the rear tractor.</p> <p>(2) Press ②SW.</p> <p>(3) Press ③SW to feed paper into the printer. Continue pressing ③SW to feed paper farther into the paper cut position. Check to confirm that the perforations are positioned within the specified range.</p> <p>If they lie outside the specified range, perform the correction below.</p>

No.	Item	Specification	Drawing	Adjustment method
4.5	Correcting paper cut position	0~0.3 mm		<div>(1) Turn on power while holding down ❶SW.</div> <div>(2) You will enter menu mode.</div> <div>(3) Select a group while holding down ❶SW.</div> <div>(4) Select on item "Cut position adjust" whild holding down ❷SW</div> <div>(5) Pressing ❸SW will move the printing position 0.05 mm from the reference position.</div> <div>(When ❹SW and ❸SW are pressed simultaneously the position will move -0.14mm)</div> <div>(6) After making the corrections and while holding down ❹SW, press ❸SW and ❷SW simultane-ously to register the correction value into printer memory.</div>

## 5. CLEANING AND LUBRICATION

### 5.1 Cleaning

#### [Cautions]

1. Be sure to turn OFF the AC POWER switch before cleaning. Remove the AC power cord from the printer.
2. Avoid dust inside the printer mechanism when cleaning.
3. If a lubricated part has been cleaned, be sure to apply lubricating oil to that portion after cleaning.

#### (1) Cleaning time

When the equipment operating time has reached six months or 300 hours, whichever comes first.

#### (2) Cleaning tools

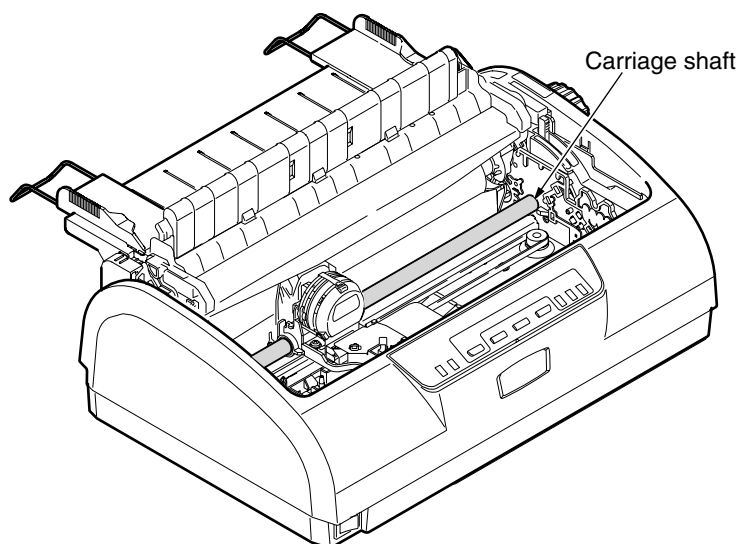
Dry cloth (soft cloth such as gauze), vacuum cleaner

#### (3) Places to be cleaned

Table 5.1 lists the places to be cleaned:

**Table 5.1**

Place to be cleaned	Cleaning procedure
Carriage shaft and the vicinity Paper travel surface	Remove paper waste and wipe off stain, dust, ribbon waste. etc.



## 5.2 Lubrication

This printer is designed to be maintenance free and requires no lubrication during normal operation. However it is necessary to apply lubricant in case the printer is disassembled, reassembled, cleaned or parts have been changed.

### (1) Cleaning time

Remarks:

- 1) Turn off the power before cleaning.
- 2) Make sure that paper dust will not fall inside of the machine.

- Cleaning period:

6 months of operation or 300 hours of operation, whichever the earlier.

- Cleaning points:

Carriage shaft and surroundings: —————> Remove paper and ribbon dust.

Paper path: —————> Clean stains and dusts.

Paper End Sensor —————> Remove the dust on the Sensor.

### (2) Lubricant

- Alvania grease or equivalent: GEP
- Pan motor oil (or equivalent): PM

### (3) Amount of lubricant

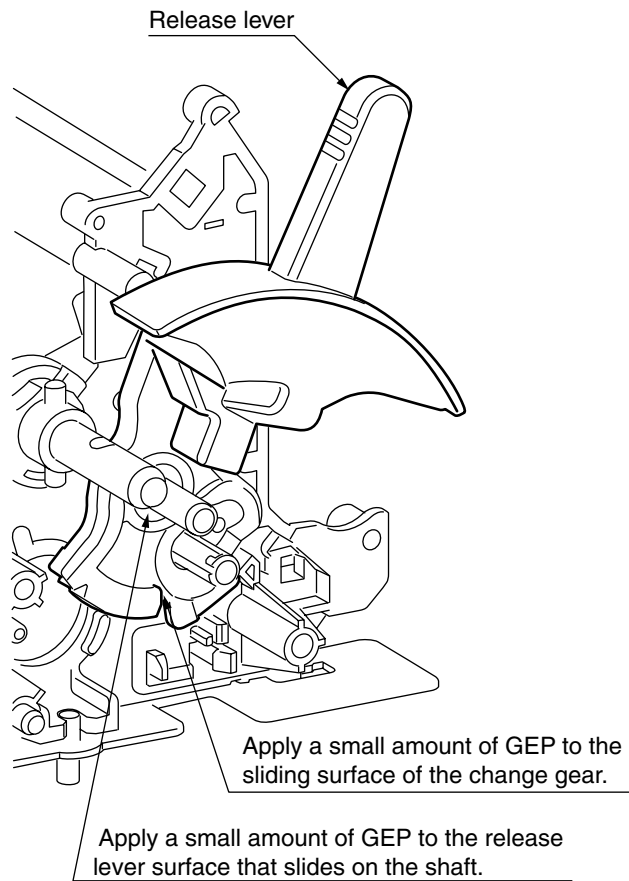
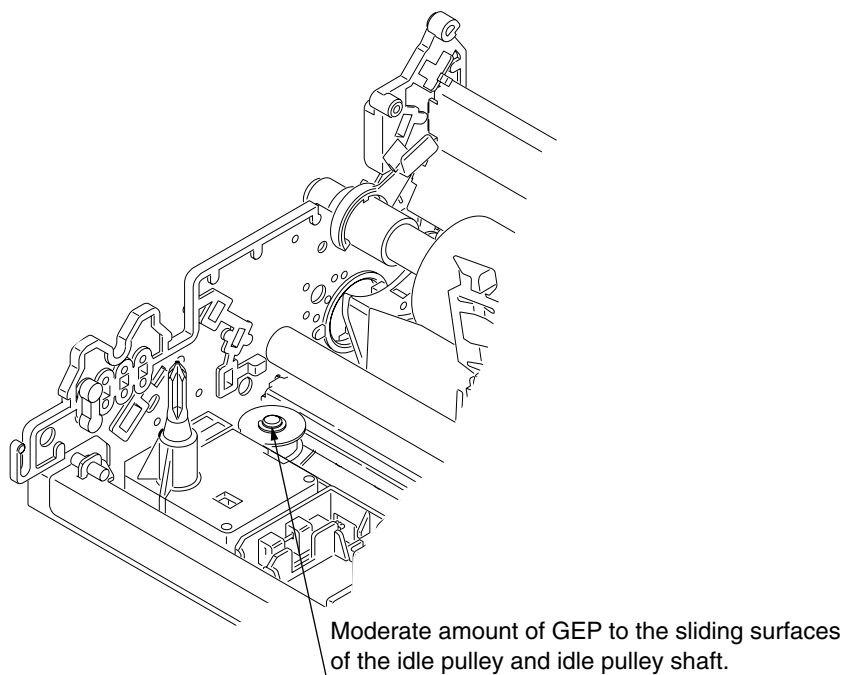
- Medium amount A : Apply three to four drops of oil, or 0.008 inch (0.2 mm) thick grease.
- Small amount B : Apply one drop of oil ( $0.006 \pm 0.002$  g)

### (4) Areas for which lubrication is prohibited

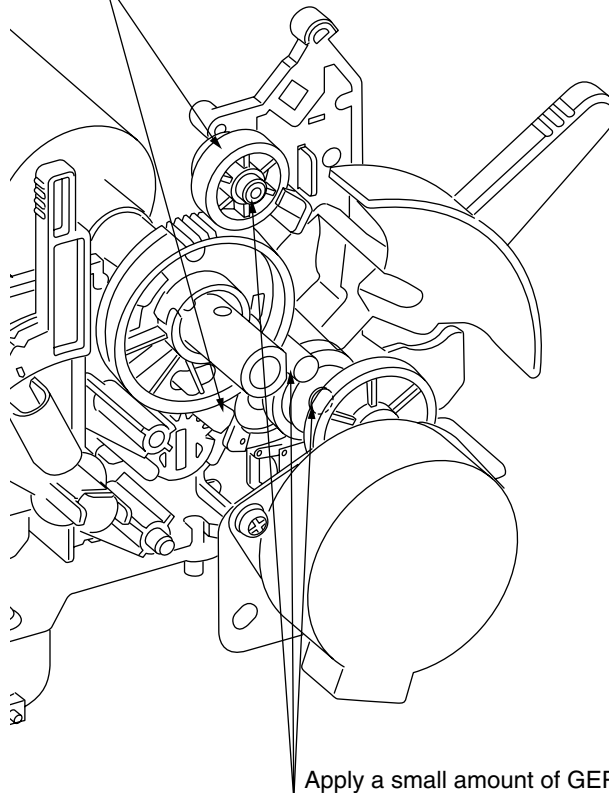
No.	Prohibited areas	Reason	Remarks
1	Platen surface	To keep paper clean	
2	Pull roller surface	To keep paper clean To prevent paper feed errors	Be careful to avoid applying lubricant to the roller surface when lubricating the fulcrum of the pressure roller.
3	Paper running surface of paper pan Paper running surface of tractor assy Paper running surface of pull roller unit	To keep paper clean To prevent paper feed errors To keep paper clean	
4	Ink ribbon	To prevent printing errors	
5	Pin tractor	To keep paper clean	
6	Flexible cable	To prevent cracks in the cable To prevent contact failure	
7	Motor	To prevent contact failure	
8	Connectors and terminals	To prevent contact failure	
9	Micro switch	To prevent contact failure	
10	Carriage shaft	To secure Carriage run load	

## (5) Lubrication point

## 1. LF drive system

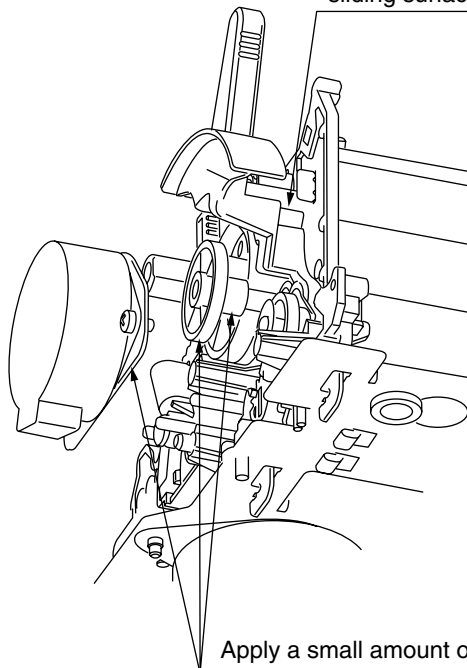


Apply a small amount of GEP to the gear tooth surfaces.



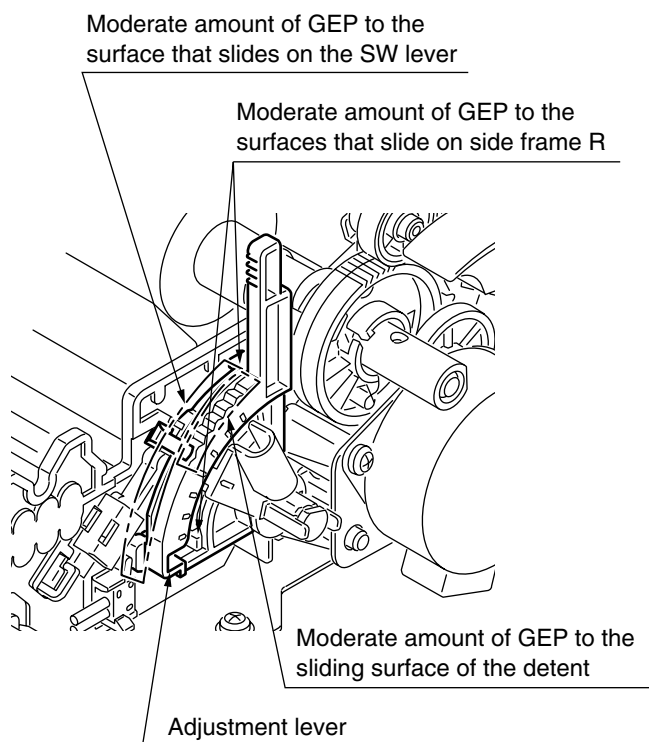
Apply a small amount of GEP to the shaft sliding surfaces.

Apply a small amount of GEP to the sliding surface of the release lever.



Apply a small amount of GEP to the gear tooth surfaces.

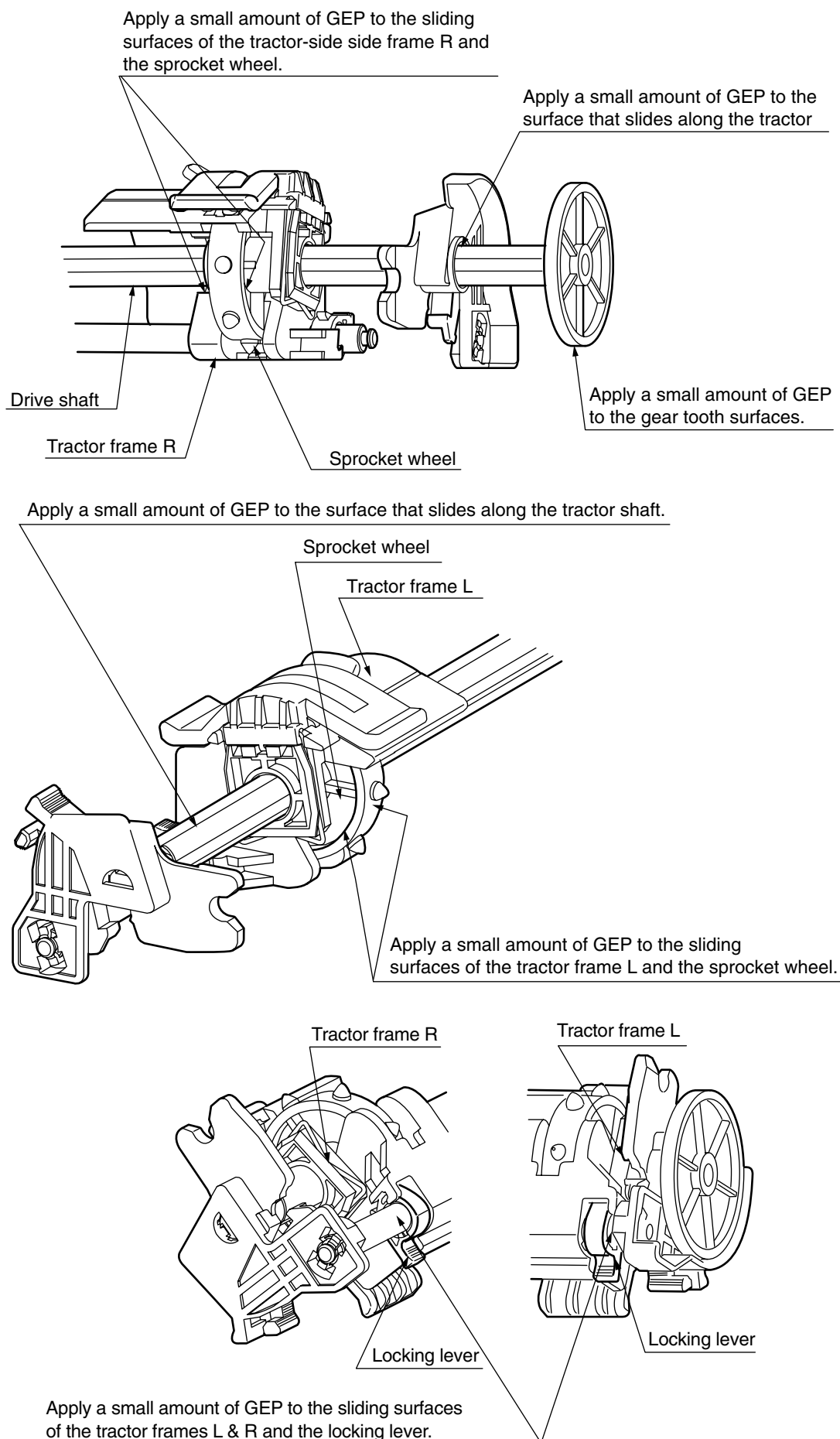
## 2. Adjustment lever



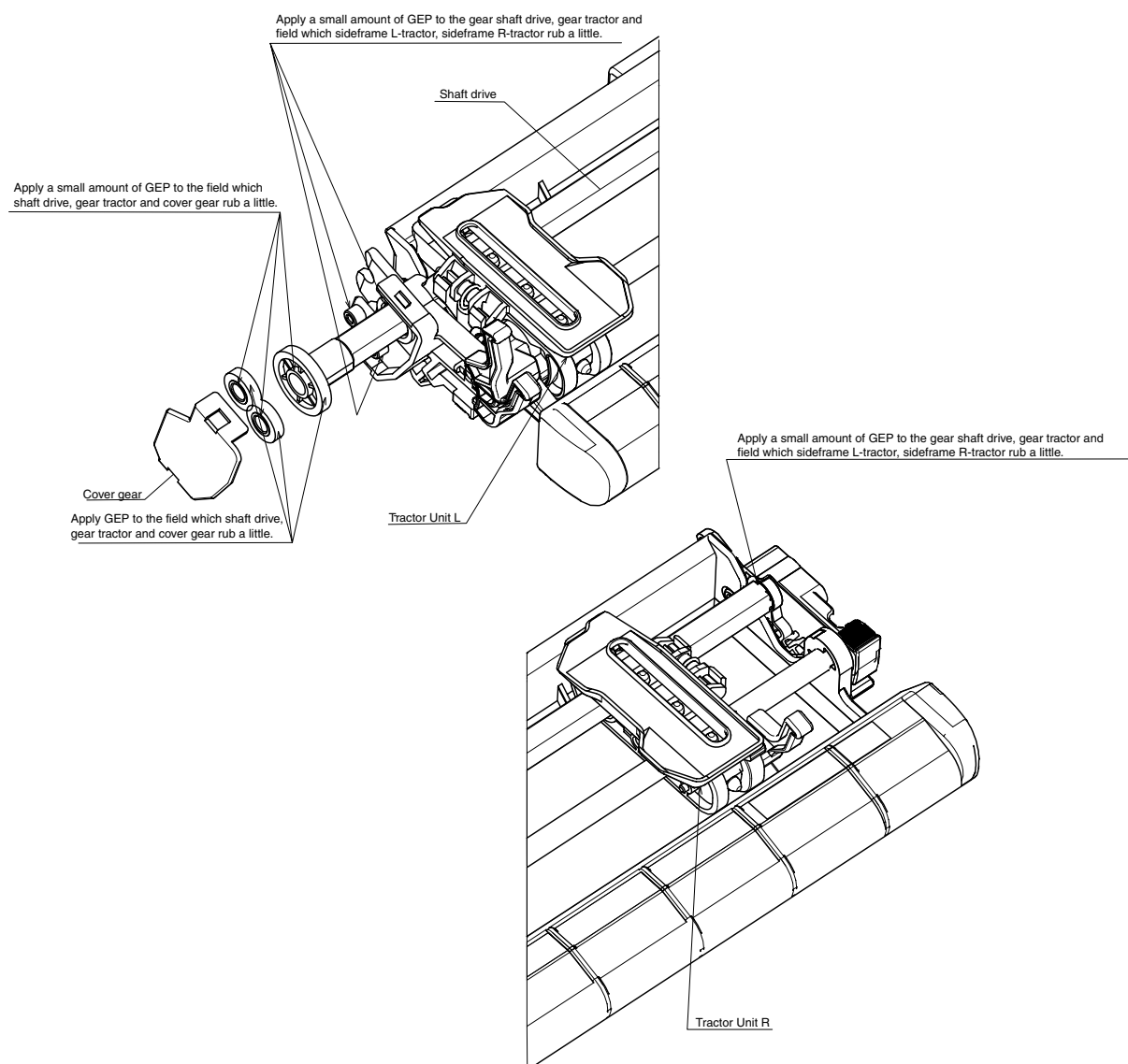


## 3. Tractor assy

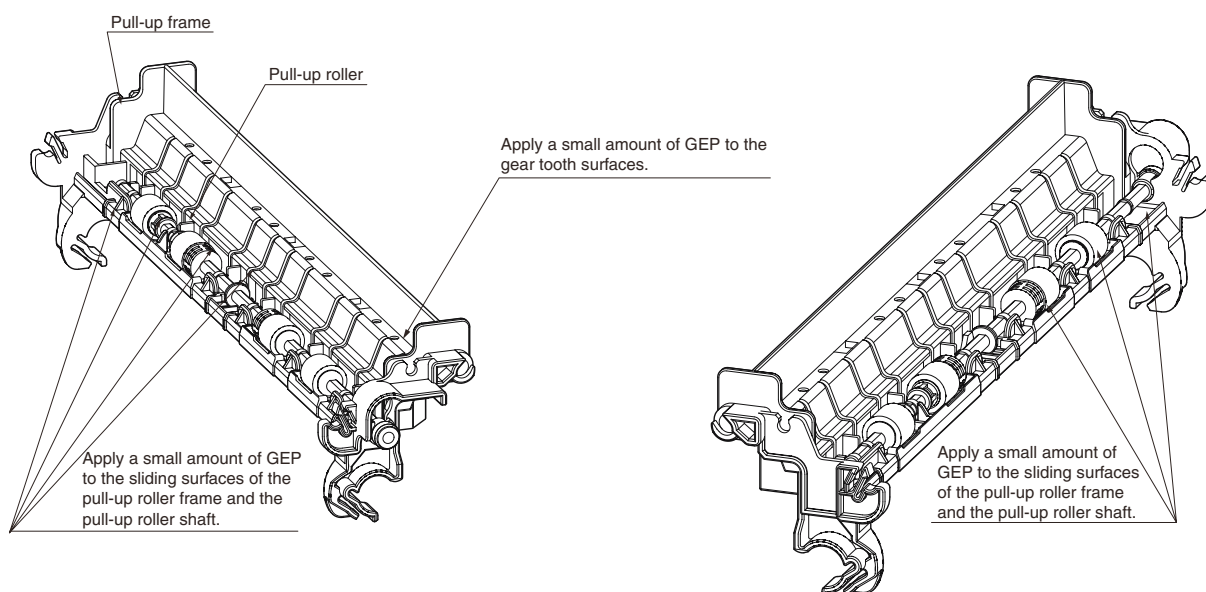
## Pin wheel Tractor Type



## Belt Tractor Type



## 4. Pull-up roller assy

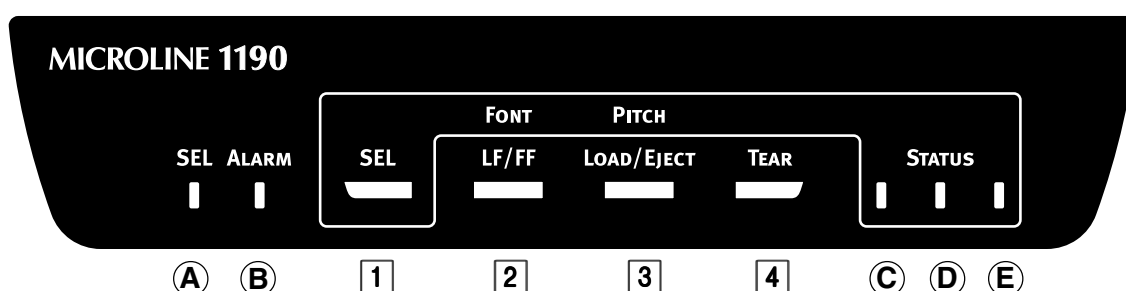


## 6. TROUBLESHOOTING AND REPAIR

### 6.1 Items to Check Before Repair

- (1) Check the inspection items specified in the instruction manual.
- (2) Find out as many details of the trouble as possible from the customer.
- (3) Inspect in the conditions as close as possible to those at the time the trouble occurred.
- (4) Proceed with the repair as follows:  
 Check the trouble status according to Table 6.1 for the details of the trouble. Then, locate the trouble position according to the detailed flowchart.
- (5) Carry out a thorough test after the repair to check for correct functioning.

- Allocation of switch lamps



- Indicator Light Functions

LED	Color	Stays lit	Stays off	Flashes
SEL	Green	<ul style="list-style-type: none"> <li>Indicates SELECT (ready to receive) status.</li> <li>Indicates power saving status (lit dim).</li> </ul>	<ul style="list-style-type: none"> <li>Indicates DESELECT state (not ready to receive).</li> </ul>	<ul style="list-style-type: none"> <li>Flashes with ALARM LED and indicates unrecoverable status alarm. (Both main and sub flashes)</li> <li>Indicates print suppression status.</li> <li>Indicates head thermal alarm (quiescent) status.</li> </ul>
ALARM	Red	<ul style="list-style-type: none"> <li>Indicates paper end status.</li> </ul>	<ul style="list-style-type: none"> <li>Indicates existence of no alarms.</li> </ul>	<ul style="list-style-type: none"> <li>Flashes with SEL LED and indicates unrecoverable status alarm. (Main flash)</li> <li>Indicates paper jam status.</li> <li>Indicates media alarm status.</li> </ul>
STATUS 1	Green	<ul style="list-style-type: none"> <li>Indicates the font, character pitch, and print mode.</li> </ul>	<ul style="list-style-type: none"> <li>Indicates the font, character pitch, and print mode.</li> </ul>	<ul style="list-style-type: none"> <li>Indicates the font, character pitch, and print mode.</li> </ul>
STATUS 2	Green	<ul style="list-style-type: none"> <li>Indicates the font, character pitch, and print mode.</li> </ul>	<ul style="list-style-type: none"> <li>Indicates the font, character pitch, and print mode.</li> </ul>	<ul style="list-style-type: none"> <li>Indicates the font, character pitch, and print mode.</li> </ul>
STATUS 3	Green	<ul style="list-style-type: none"> <li>Indicates the font, character pitch, and print mode.</li> </ul>	<ul style="list-style-type: none"> <li>Indicates the font, character pitch, and print mode.</li> </ul>	<ul style="list-style-type: none"> <li>Indicates the font, character pitch, and print mode.</li> </ul>

## (1) LED Indication

Printer status corresponding to each LED that stays lit, stays off, or flashing is listed below.

Printer Status		LED		STATUS			REMARK
		SEL	ALARM	1	2	3	
		Green	Red	Green	Green	Green	
Power ON (printer being initialized) *3		O	O	O	O	O	
Power OFF		X	X	X	X	X	
SELECT (on-line)		O					
DESELECT (off-line)		X					
Print suppression		☆	X	X	X	X	
Power saving		☆	X	X	X	X	
Unrecoverable error		☆	☆	X	X	X	
Font	LQ Courier					O	Displayed in normal or at the time of setting
	LQ Roman				O		
	LQ Swiss			O			
	LQ Swiss Bold					☆	
	LQ Orator				☆		
	LQ Gothic			☆			
	LQ Prestige				O	O	
	LQ OCR-A			O		O	
	LQ OCR-B			O	O		
	Utility				☆	☆	
	HSD			☆		☆	
Character pitch	10CPI					O	Displayed at the time of setting
	12CPI				O		
	15CPI					☆	
	17CPI				☆		
	20CPI				O	O	
	Prop				☆	☆	

\*1 Meanings of symbols: O: Stays lit, X: Stays off, ☆: Flashes, No symbol: Previous status

\*2 The flash cycle time of LED is 400ms.

\*3 Every LED lights up immediately after power on of the printer and lights out after RAM checking.

SEL LED and STATUS LED are displayed when SELECT/DESELECT is determined.

Note: Staying lit or blinking of any LED always indicates power on of the printer.

## (2) Alarm/Error Indications

The following table summarizes LED indications during alarm states.

## 1) Recoverable Alarms

Printer Status \ LED	SEL	ALARM	STATUS		REMARK
			1	2	
	Green	Red	Green	Green	
Paper end	X	O			
Paper jam	X	☆			
Media alarm	X	☆			
Head thermal alarm (stopped) status (on-line)	☆				

\*1 Meanings of symbols: O: Stays lit, X: Stays off, ☆: Flashes ●: stays lit darkly, No symbol: Previous status

\*2 The flash cycle time of LED is 400ms.

## 2) Fatal alarms

Details of fatal alarm are listed in the table below, and the number of flashes of SEL LED and ALARM LED represents alarm status.

Alarm status indication consists of combinations of main flash and sub flash. Both SEL LED and ALARM LED flash simultaneously in main flash, and only SEL LED flashes in sub flash.

Alarm indication		Paper end
No. of main flashes	No. of sub flashes	
1	1	Head homing alarm
	2	Spacing alarm
2	1	Program ROM alarm
	2	CG ROM alarm
3	1	Printer external RAM alarm
	2	EEPROM alarm
4	2	CPU alarm (printer internal RAM, BRK, NMI, WDT)
9	1	Head A/D alarm

## (3) Items to search

Table 6-1

Fault	Specific Content	Section to Refer
Power source abnormality	There is no response when turning on the power switch. (No lamps illuminate.)	①
Reset circuit abnormality	The carriage does not move at power ON and lamp some illuminates faintly.	②
Operator panel abnormality	Some lamps do not illuminate (although the carriage moves.)	③
	Some lamps illuminate and stay ON.	④
	Some switches do not function or functions continuously.	⑤
Carriage operation abnormality	The carriage does not move at power ON or an alarm generates while printing thus the print job is stopped and an alarm is indicated.	⑥
	The movement of the carriage is abnormal (runs out of control, vibrates, stops during homing, etc.) and an alarm is indicated.	⑦
Paper feed abnormality	Paper-end is generated even when paper is set. (Lamp ② goes on.) Paper-end does not generate even in paper-end condition. (Lamp ② goes off.)	⑧
	Line is not fed upon receiving/printing data.	⑨
Ink ribbon feed abnormality	Print result is faint. The ink ribbon is not fed properly or is not sent at all.	⑩
Print condition abnormality	Print dots are missing.	⑪
	Space movement is normal but print is not performed.	⑫
Interface abnormality	Upon receiving/printing data: Spacing or printing is not performed and Lamp ① is illuminating goes on.	⑬
	Upon receiving/printing data: Wrong characters are printed. Some characters are missing. Lamp ① is illuminating.	⑭

## ① There is no response when turning On the power switch. (No lamps illuminate.)

Is the AC cord conduction normal?

N: Replace the AC cord.

Y: Is the AC fuse (F1) in the Pow Unit burned out?

Y: Replace the fuse (F1).

N: Is the LF Motor Cable disconnected from the LFMOT Connector on the Control board, or is the SP Motor Cable disconnected from the SPMOT Connector on the Control board?

Y: Connect the Motor Cable to the Control board properly.

N: Is the LF Motor Cable broken?

Y: Replace the LF Motor.

N: Is the SP Motor Cable broken?

Y: Replace the SP Motor.

N: Is the voltage in the table below being output to the connector (POW) for the Pow Unit?

Connector	Pin No.	Voltage
CN1	1, 2, 12~15	+35V
	4, 5, 11	0V (logic-type)
	6, 10	+5V
	7~9	0V (drive-type)

Y: Is the power cord connected properly?

N: Reconnect the cord properly.

Y: Replace the Pow Unit.

## ② The carriage does not move at power ON and only lamp some illuminates faintly.

Replace the Control board.

## ③ Some lamps do not illuminate (although the carriage moves.)

Is the operator panel connector (OP) cord properly?

N: Connect the cord properly.

Y: Replace the LSO print circuit board.

N: Replace the Control board.

④ Some lamps illuminate and stay ON.

- Is the operator panel connector (OP) cord properly?
  - N: Connect the cord properly.
  - Y: Replace the LSO print circuit board.
    - N: Replace the Control board.

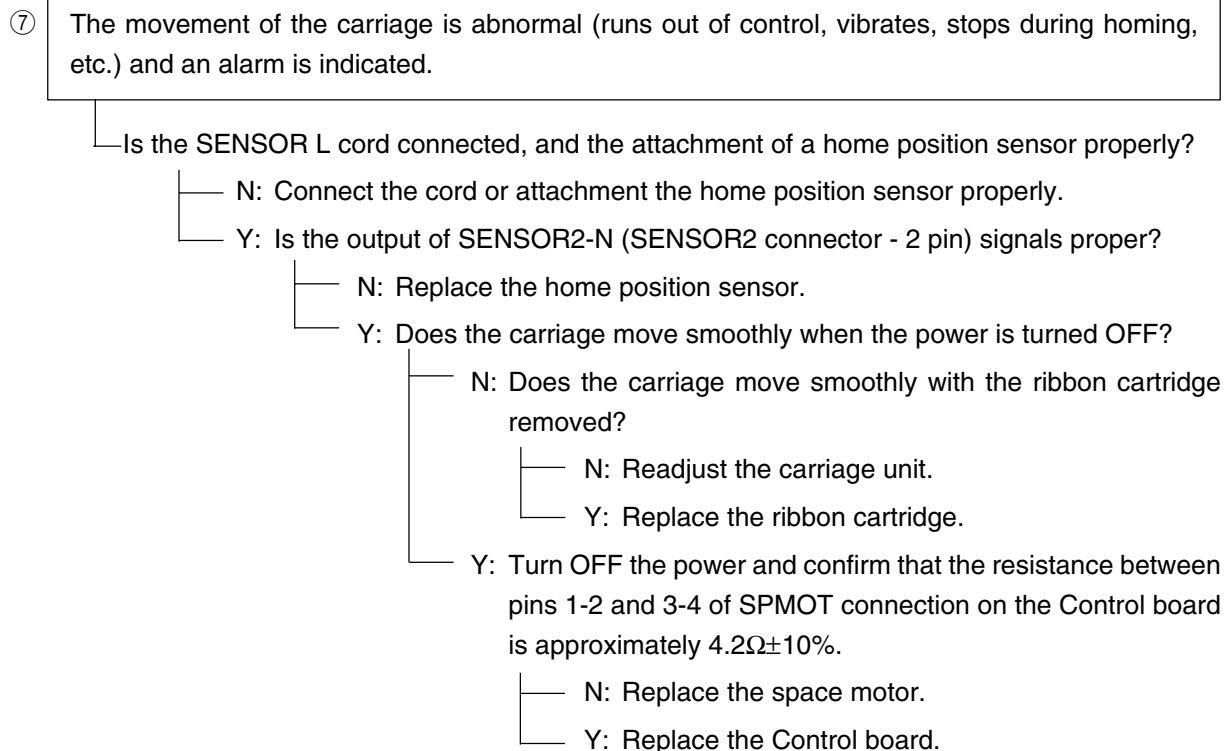
⑤ Some switches do not function or functions continuously.

- Is the operator panel connector (OP) cord properly?
  - N: Connect the cord properly.
  - Y: Replace the LSO print circuit board.
    - N: Replace the Control board.

⑥ The carriage does not move at power ON or an alarm generates while printing thus the print job is stopped and an alarm is indicated.

- Does the carriage move smoothly by hand when the power is turn OFF?
  - N: Does the carriage move smoothly with the ribbon cartridge removed?
    - N: Readjust the carriage unit.
    - Y: Replace the ribbon cartridge.
  - Y: Is +35V being output properly? (See Section ①)
    - N: Replace the Pow Unit.
    - Y: Is the fuse ( F4 on the Control board) burned out?
      - Y: Replace the Control board.
      - N: Is the SP motor cord connected properly?
        - N: Connect the cord properly.
        - Y: Turn OFF the power, remove the SP motor connection, and confirm that the resistance between pins 1-2 and 3-4 of the SP motor connector (SPMOT) is approximately  $4.2\Omega \pm 10\%$ .
          - N: Replace the space motor.
          - Y: Replace the Control board.





⑧ Paper-end is generated even when paper is set. (Lamp **B** goes on.) Paper-end does not generate even in paper-end condition. (Lamp **B** goes off.)

1) When using cut-sheets:

Set to menu mode and perform menu print.

If PE detect is set to OFF, reset to ON, and after confirming that paper-end is indicated, set to menu mode OFF.

Perform the following procedure if paper-end is not indicated.

- 2) Is the SENSOR1 cord connected and the attachment of the paper end sensor properly?
- N: Connect the cord or attach the paper end sensor properly.
    - Is the output of SENSOR1-N (SENSOR1 connector-5 pin) signals proper?
      - N: Replace the paper end sensor.
      - Y: Replace the Control board.
  - Y: Set paper and feed the paper by turning the platen knob.

⑨ Line is not fed upon receiving/printing data.

Is the LF motor cord connected properly?

N: Connect the cord properly.

Y: Turn OFF the power, remove the LF motor connector, and confirm that the resistance between pins 1-2 and 3-4 of the LF motor connector (LFMOT) is approximately  $12.1\Omega \pm 10\%$ .

N: Replace the LF motor.

Y: Replace the Control board.

⑩

- Print result is faint.
- The ink ribbon is not fed properly or is not sent at all.

Is the ribbon being fed properly during a print job?

N: Remove the ribbon cartridge and check if the ribbon feed mechanism is operating properly.

N: Replace the ribbon feed gear assembly.

Y: Replace the ribbon cartridge.

Y: Has the ink ribbon reached its life?

Y: Replace the ribbon cartridge.

N: Is the head gap set at the regulated value?

N: Readjust the head gap.

Y: Replace the print head.

⑪

Print dots are missing.

Is the head gap set at the regulated value?

N: Readjust the head gap properly.

Y: Are dots still missing after replacing the print head?

N: End the procedure.

Y: Are dots still missing after replacing the space motor assembly?

N: End the procedure.

Y: Are the sections between the Control board HD1, HD2 ↔ head cable ↔ carriage ↔ print head connected properly?

N: Reinstall properly.

Y: Replace the Control board.

⑫

Space movement is normal but print is not performed.

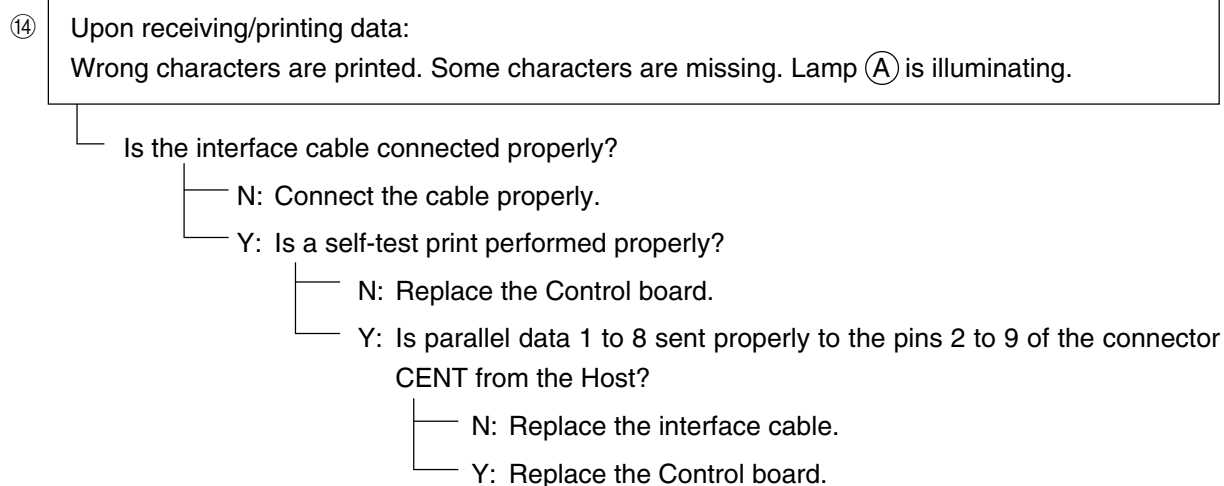
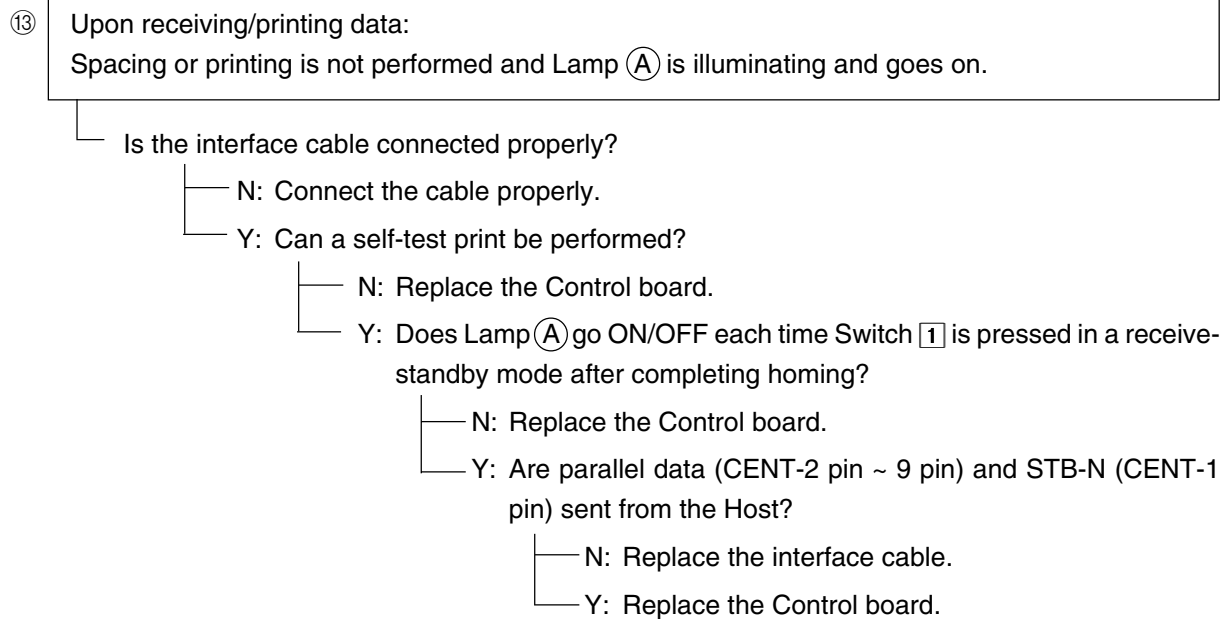
Is print disabled even after replacing the print head?

N: End the procedure.

Y: Are the sections between the Control board HD1, HD2 ↔ head cable ↔ carriage ↔ print head connected properly?

N: Reinstall properly.

Y: Replace the Control board.



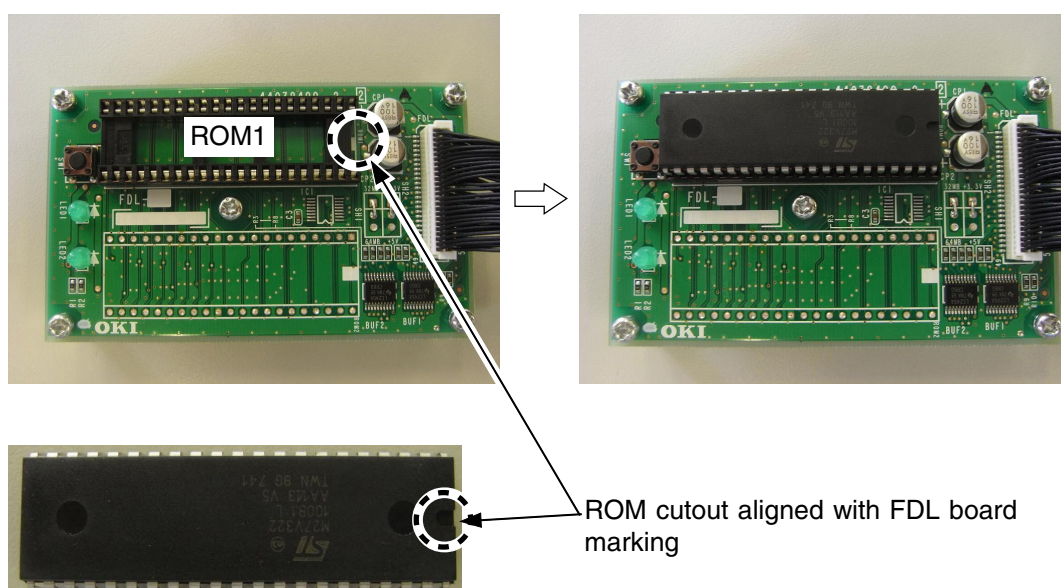
## 7. Flash Memory Reprogramming Procedure

### 7.1 Parts Required

No.	Part No.	Type	Quantity
①	44038501	FDL board	1
②	—	M27V322-100B1 (manufactured by ST-Microelectronics) or equivalent. * Applicable flash memory download program-written ROM.	1
③	44044001	Connection cable	1

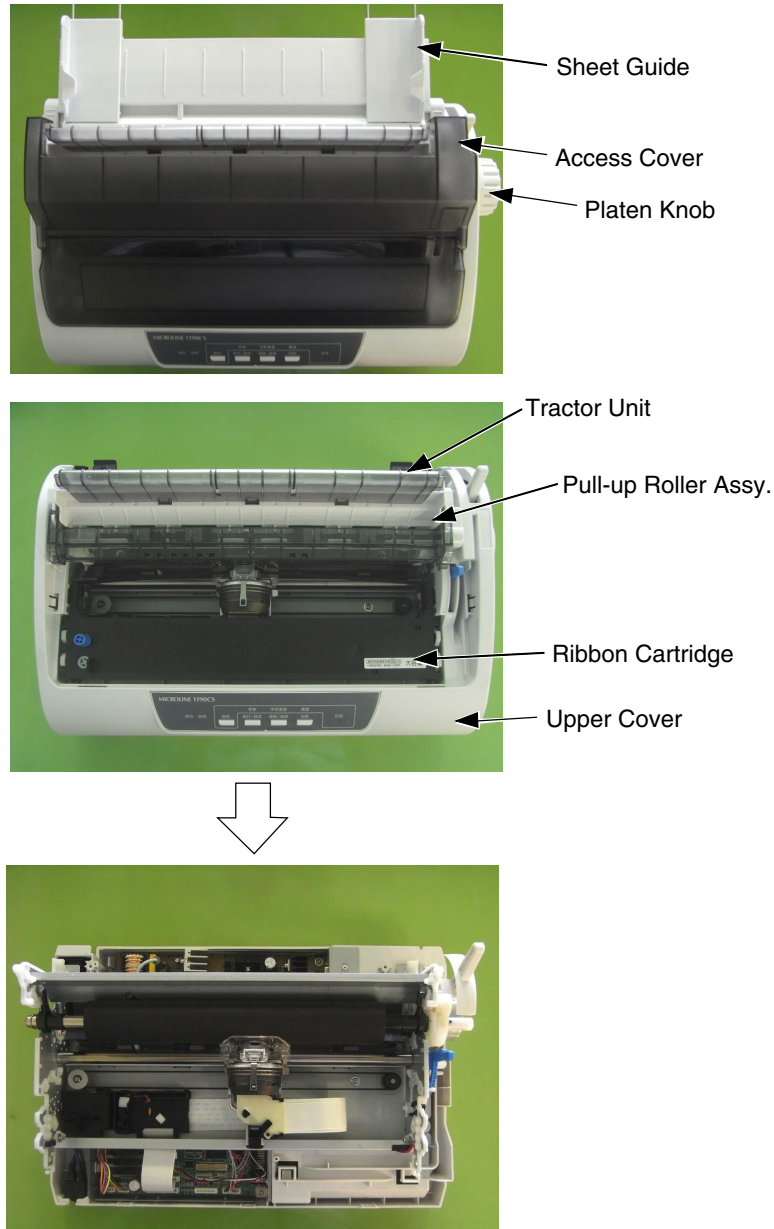
### 7.2 Setup of FDL Board (Flash Memory Reprogramming Board)

- (1) Mount an applicable flash memory download program-prewritten ROM ② on the FDL board (flash memory reprogramming board) ①. So oriented as that its cutout is aligned with the marking appearing on the FDL board ①, the ROM ② should be mounted on the board.

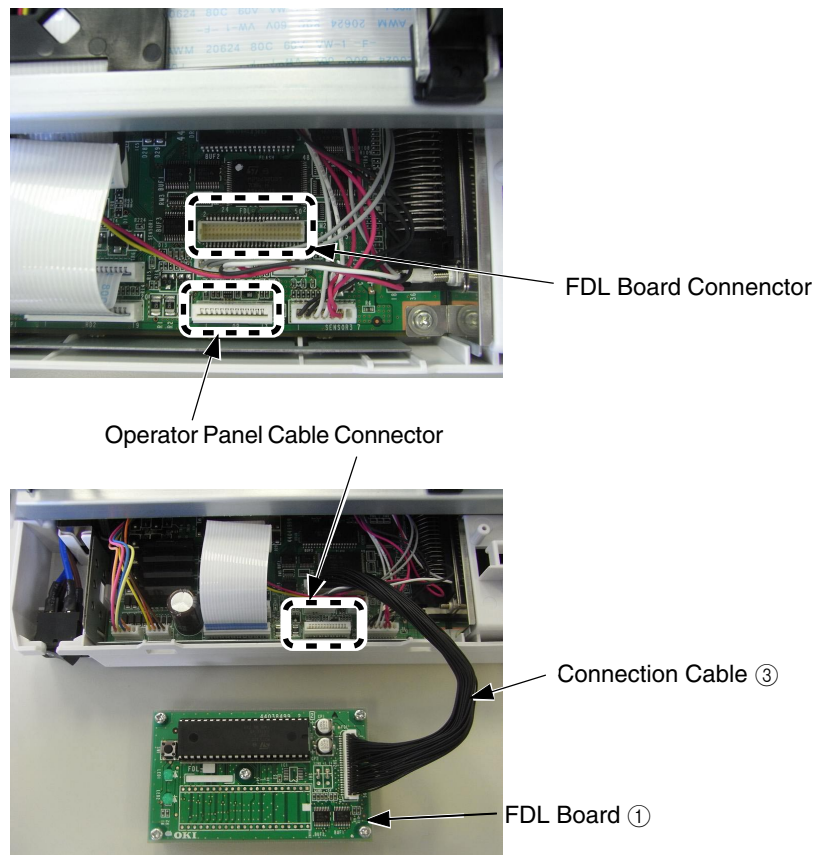


### 7.3 Flash Memory Reprogramming Procedure

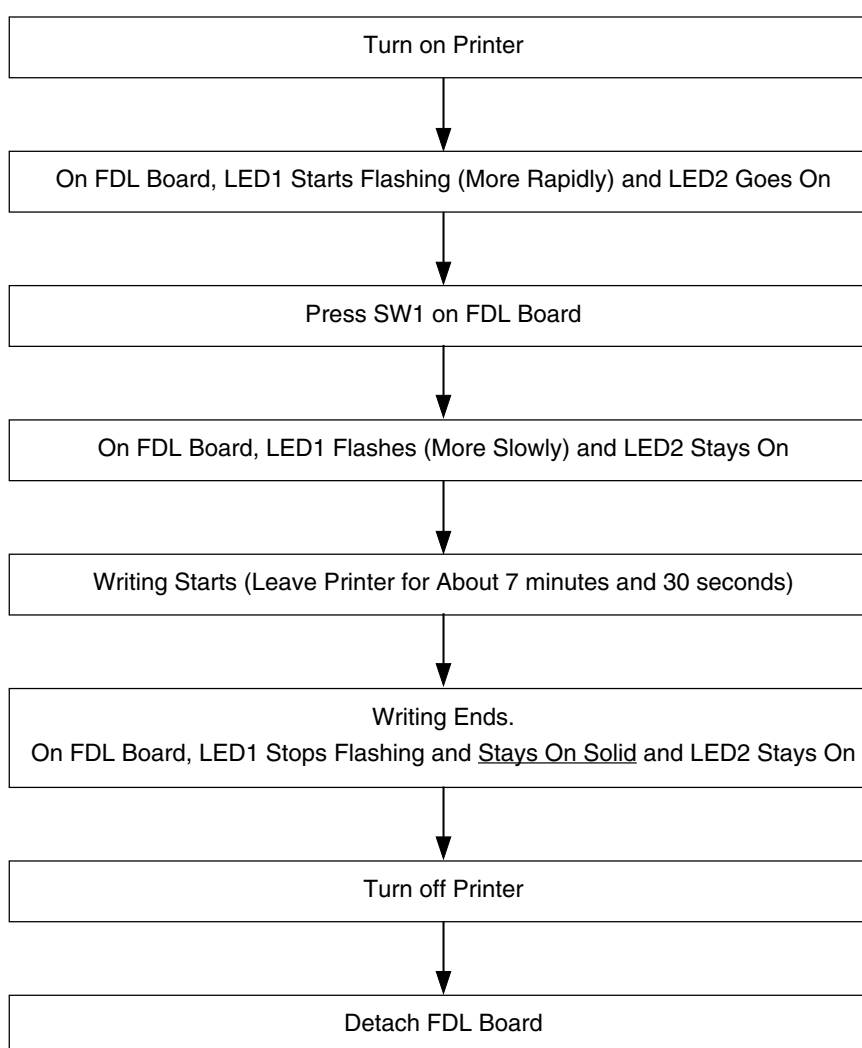
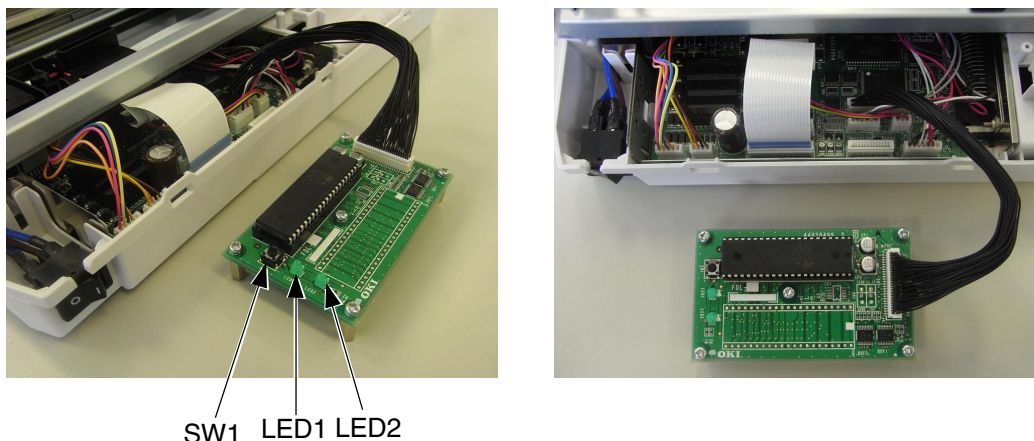
- (1) Turn off the printer and unplug the AC cable.
- (2) Remove the sheet guide, access cover, tractor unit, pull-up roller assy., platen knob, ribbon cartridge and upper cover from the printer.



- (3) Connect the FDL board ① to the control board (M24 board). The FDL board must be connected with nothing connected to the operator panel cable connector.



- (4) Reprogram the flash memory: After performing steps (1) through (3), connect the AC cable to the printer and follow the steps shown below to reprogram the ROM.



**Note:** Turn on the printer before pressing the SW1. While holding down the SW1, never turn on the printer.

- (5) Using the detaching steps in reverse order, attach the cover and make the printer ready to print data. By checking that the firmware version on the rolling ASCII print header has been changed, judge whether this flash memory reprogramming succeeded.



## 7.4 Flash Memory Reprogramming Notes and Dealing with Abnormal Termination

### (1) Notes During Program Writing

- During program writing on a printer (while the LED1 of a printer is flashing), do not turn off the printer.
- During program writing on a printer, do not detach the FDL board ①, ROM ② or connection cable ③ of the printer.

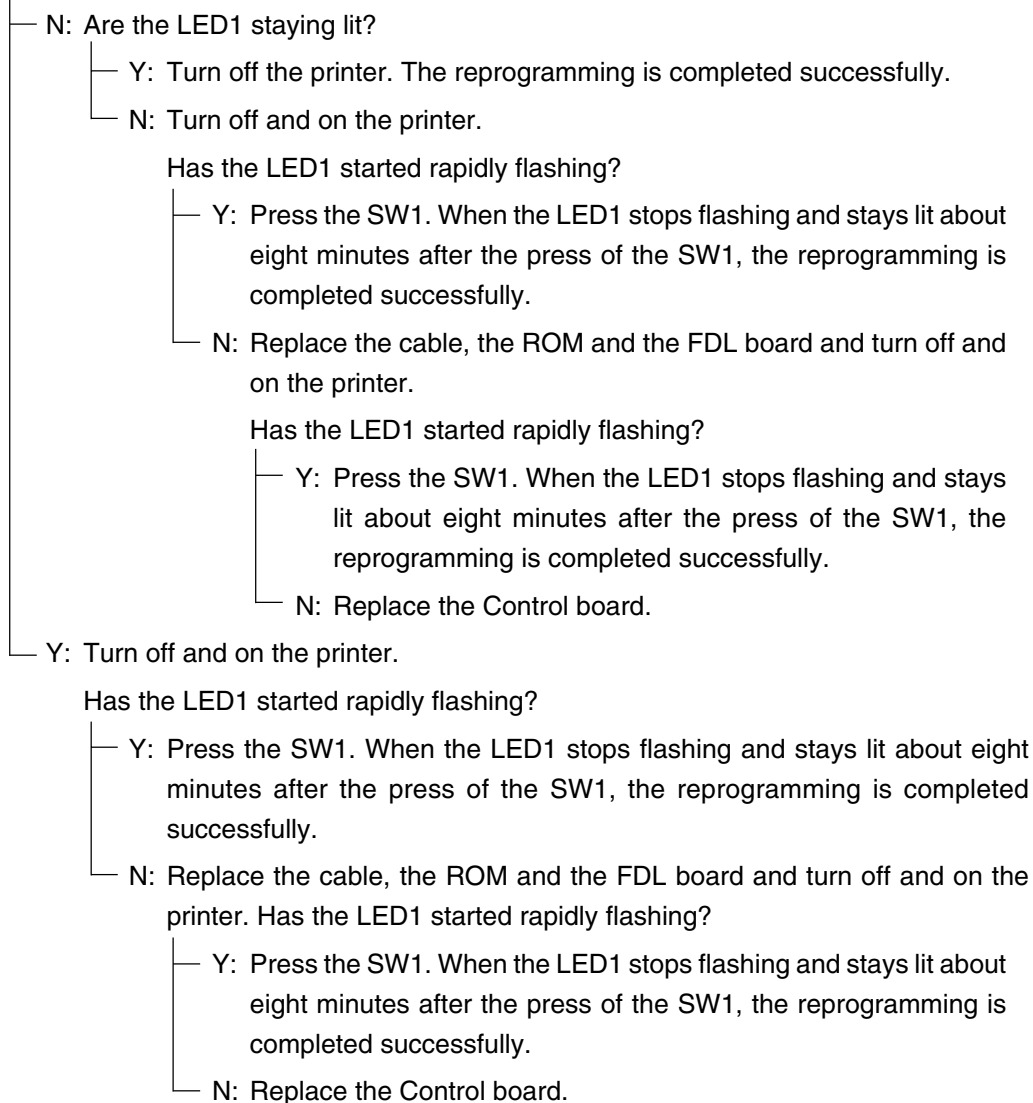
### (2) Notes on Abnormal Termination

Without turning off a printer first, do not detach the FDL board ①, ROM ② or connection cable ③ of the printer.

### (3) Dealing with Abnormal Termination

To deal with an abnormal termination of flash memory reprogramming on a printer (a printer's FDL board LED1's slower flashing and turning off that are repeatedly performed after eight minutes or more of the end of flash memory reprogramming on the printer), follow these steps:

After eight minutes or more of the end of the behavior for the reprogramming, are the LED1 repeatedly performing flashing and turning off?

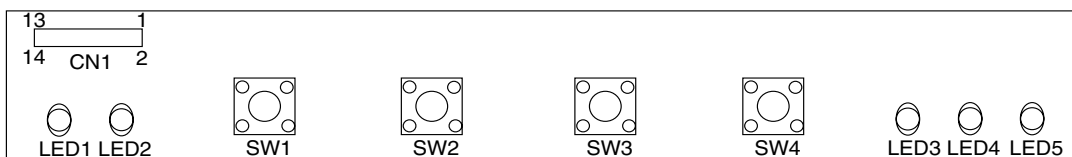


## APPENDIX A PCB LAYOUT

### - PCB List -

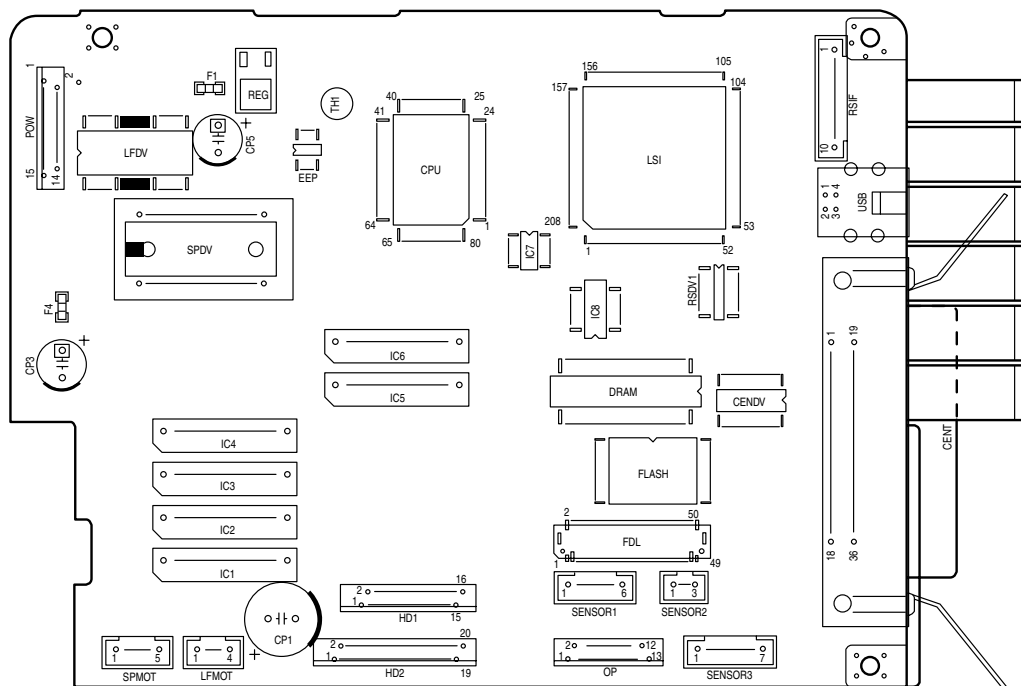
- (1) Circuit board, LSO (Operator Panel)
- (2) Circuit board, M24 (Main Controller) : OEL/TAIWAN/THAI : Rev. ~B0 AOS : Rev. C0
- (3) Circuit board, P24 (Main Controller) : OEL/TAIWAN/THAI : Rev. D0~ AOS : Rev. E0~

• (1) LSO-Printed-Circuit Board

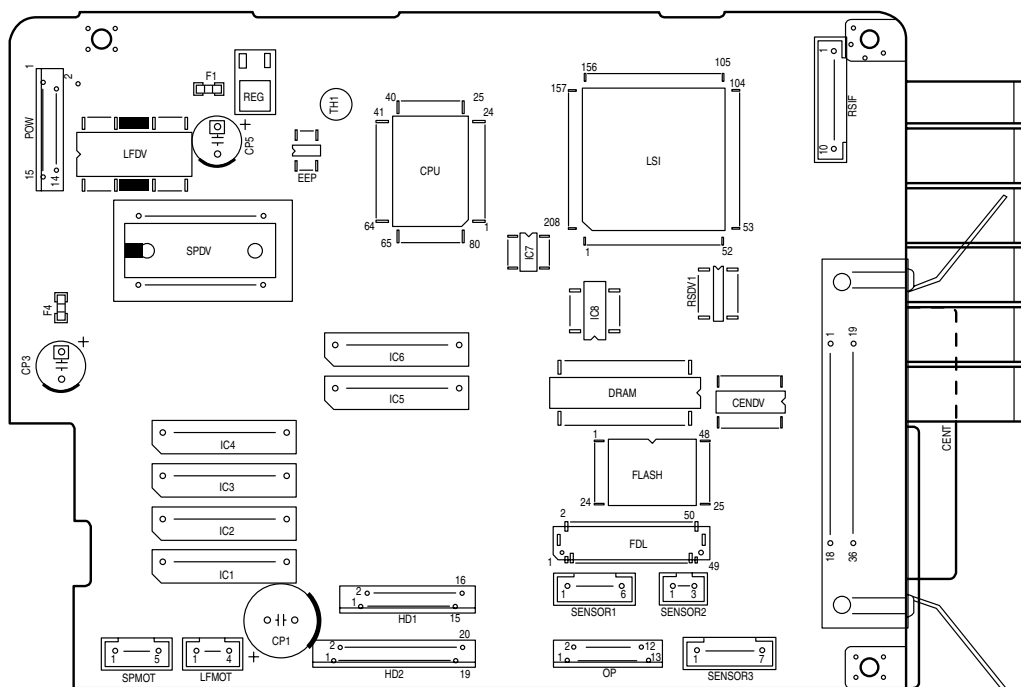


• (2) M24-Control Board (for OEL/TAIWAN/THAI : Rev. ~B0 AOS : Rev.C0)

Centronics, RS, USB Model



Centronics, RS Model



- (3) P24-Control Board (for OEL/TAIWAN/THAI : Rev. D0~ AOS : Rev.E0~)

Centronics, RS, USB Model

